THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

Weekly Newspaper

Second-class postage paid at Boston, Mass., and additional mailing offices

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5/year

December 27, 1976/January 3, 1977

Vol. X, No. 52-Vol. XI, No. 1

Did Someone Lie To Make SSA Case For More DP?

By Edith Holn

Of the CW Staff D.C. — Someo WASHINGTON, D.C. — Someone in the Social Security Administration (SSA) deliberately misquoted utilization studies of that agency's computer operation in an effort to convince its commissioner and Congress that the SSA needed expanded DP facilities, the House Ways

and Means Oversight Committee believes.
Utilization studies conducted by the General Accounting Office (GAO) and by an independent consultant using Boe ing Computer Systems, Inc.'s Systems Analysis and Resource Accounting package during 1976 showed the SSA was making less than 50% effective use of its computer equipment.

Letters from SSA Commissioner James B. Cardwell to various congressional committees concerning the agency's plans to expand its operation with additional equipment and a new multimillion dollar computer facility left out important quotes from or references to these studies, according to William Vaughan, a subcommittee staff member.

Vaughan, who has just completed an analysis of letters by the commissioner to Congress, said he found the omissions the commissioner to "unconscionable." However, he said he believes Cardwell is "an honorable man" and suggested the problem rests with someone on the commissioner's staff.

By the time this story appears, Vaughan said, the subcommittee's chairman, Rep. Charles A. Vanik, will have addressed "a strong leter to the commissioner detailthese omissions and encouraging him to check with his staff on this matter.

This event capped a year of maneuvering by the SSA to add four IBM 370/168s to the 17 large-scale computer systems that now process most of its workload, to conduct a \$2.3 million renovation of space in which to temporarily house these machines and to build what is now estimated by the General Services Administration (GSA) to be a \$73 million computer facility in Woodlawn, Md. - all with a (Continued on Page 4)

IBM a Client of Bell's Firm

Carter's Attorney General Choice Tied to

By E. Drake Lundell Jr.

Of the CW Staff ATLANTA - Griffin B. Bell. President-

elect Jimmy Carter's choice for Attorney General, comes from a law firm that is presently doing work for IBM, raising the number of Cabinet appointees with IBM ties to

An IBMer had previously landed the nomination for the post of Secretary of State and, last week, Carter nominated people with IBM ties to be Secretary of Defense, Secretary of Housing and Urban Affairs and head of the Justice Department.

But the appointment to the Department of Justice was clearly the most sensitive since the department is in charge of prosecuting the government's massive antitrust suit against the firm.

Bell, a former judge on the Fifth District Court of Appeals in New Orleans, is a partner in the law firm of King and Spalding.

Another member of that firm is Charles Kirbo, who is probably the closest adviser to the President-elect. Kirbo, in fact, has been called "Mr. Carter's gray eminence" and has had a hand in all of the Presidentelect's Cabinet appointments so far.

and Spalding represents many powerful business interests, including such firms as Coca-Cola and General Motors. and is known as a specialist in corporate

legal affairs.
While the law firm is not on retainer, IBM has often used it to represent IBM on "routine commercial matters" in the Atlanta area, an IBM spokesman admitted last week.

King and Spalding is currently working

on a case for IBM, the spokesman said, but he declined to divulge what that case involved.

However, the IBM spokesman claimed the work performed for IBM by King and Spalding was "not significant" and concerned such things as collections and bankruptcies.

In addition to Bell, Carter also named two others with close IBM ties as nominees for Cabinet positions last week.

As expected [CW, Dec. 13], he named Harold Brown, president of the California Institute of Technology, to be Secretary of Defense. Brown, a former Secretary of the Air Force and Director of Defense Research and Engineering, has been a director of IBM since 1972.

Brown has also been a delegate to the Strategic Arms Limitation Talks since 1969 and is a director of Schroders Ltd., The (Continued on Page 6)

<u>Chicago Company Charged</u>

DP Implicated in \$40 Million Fraud

Of the CW Staff

CHICAGO - The DP manager and a programmer at Cenco, Inc. here have been charged — along with 17 others — in a \$40 million fraud scheme in which the firm's computer system was allegedly used to cover the perpetrators' tracks.

Cenco inflated its inventory records in order to mislead potential stock purchases,

the charges brought by the Securities and Exchange Commission (SEC) in U.S. District Court here indicated.

The 169-count complaint also accused the firm of using its computer system to inflate its 1973 revenues by about \$2 million and employing other tactics to expand the scope of the fraud scheme to approximately \$40 million.

While the complaint was unclear on how almost \$28 million in nonexistent inventory got on Cenco's books — and into the computer system's records — it indicated the system played an integral part in the company's attempts to cover up that inflated inventory.

Those listed in the complaint were Cenco itself, a subsidiary of the company and 17 others, including Arthur Auman, who served as Cenco's DP manager, and Anthony Urso, who "had responsibility for programming the Cenco computer," ac-cording to the SEC filing.

Cenco, a corporation registered in Delaware, is engaged in the manufacture and distribution of services and products in the fields of health care, education, water pollution abatement and nursing homes.

The fraud was uncovered in 1975, according to the complaint, when the firm issued press release indicating it would reduce its inventory by scrapping many items.

This was misleading and fraudulent, the complaint charged, because the inventory in question "did not exist" and "management was involved in a scheme to conceal the fact that the Cenco inventory had been massively inflated by the recording of inventory which did not exist."

But while the complaint was not clear on how so much nonexistent inventory got into the computer system records, it alleged that in 1973 and 1974 the inventory "was inflated by alteration of inventory tags used to record the physical count of inventory, alteration of computer listings generated to reflect the results of the physical count and (Continued on Page 6)

CDC Shuffles Prices On Systems, Services

MINNEAPOLIS - Control Data Corp. has adjusted lease, purchase and maintenance prices for new orders on selected equipment effective immediately.

Some purchase and lease prices for largescale Cyber 170 systems were decreased by 6% while others were increased by 6% Prices for peripheral equipment were also raised 6% while add-on memory for the 170 series was reportedly reduced in purchase price from 15% to 30%.

Domestic prices for computer services were hiked an average 8.5%; time and materials were raised an average 12.7% for specialized consulting services.

Notice to Subscribers

This is Computerworld's annual combination issue. Coverage of the main events of 1976 begins on Page 2.

Supreme Court Rejects AT&T Bid To End FCC Interconnect Control

By Ronald A. Frank

Of the CW Staff
WASHINGTON, D.C. — A final legal
attempt by AT&T to challenge Federal Communications Commission (FCC) authority over interconnection has been rejected by the U.S. Supreme Court.

Specifically, the Supreme Court refused to

review a ruling of the U.S. Fourth Circuit Court of Appeals special panel which decided the FCC had a right to determine what noncarrier equipment can be interconnected to the telephone network and what methods should be used.

The Supreme Court action culminated a long AT&T legal attempt to get jurisdiction of the interconnection question out of the FCC's hands and into the state regulatory commissions, where Bell felt it would get more consideration.

The legal proceeding was set in motion in 1973 when the North Carolina Utilities Commission said noncarrier equipment could not be interconnected with the telephone network within the state.

Independent suppliers equipment challenged this ruling with the basic claim that the phone net was an interstate resource and interconnection questions could be determined only at the FCC (and not the state) level.
In upholding the jurisdiction of the FCC,

the Supreme Court may have speeded the finalization of the FCC's certification/registration program, which has been authorized by the commission to replace the Bell-fostered system of access arrangements.

AT&T and other segments of the tele-(Continued on Page 4)

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Second-class postage paid at Boston, Mass., and additional mailing offices. Published weekly (except: a single combined issue for the last week in December and the first week in January) by Computerworld, Inc., 797 Washington St., Computerworld, Inc., 797 Washington St., Newton, Mass. 02160. Copyright 1976 by Com-puterworld, Inc. All rights reserved.

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Questions But No Decisions

Spotlight Rested on AT&T Future in '76

Of the CW Staff

The year 1976 will go into history as one in which the future role of AT&T in the competitive world of telecommunications came under a sharp regulatory and legislative spotlight.

Although many questions were aired, few decisions were made, however,

In March the Bell System, with support from the rest of the telephone carrier industry, entered into the House of Representatives a bill called the Consumer Communications Reform Act. The proposed legislation was designed to cement Bell's position as a monopoly supplier and would have all but eliminated competition in the specialized carrier and interconnection areas so carefully nurtured by the Federal Communications Commission (FCC).

Some saw the Reform Act as a last-ditch attempt by Bell and its chief John deButts to appeal to Congress with a cause that had been rejected both by the FCC and in the courts. While deButts regarded the goals of the legislation as a type of manifest destiny, AT&T's many competitors saw the bill as a threat to their existence.

Bell launched an intensive effort to visit each member of Congress to solicit support for the measure. Many House members

said they favored the bill only because they wanted a new look at the Communications

Act of 1934, which had set up the FCC. By year's end the House Subcommittee on Communications had held only three days of preliminary hearings and the bill died as Congress adjourned.

There was little doubt a similar proposal would be reintroduced early in 1977. Some

A Look Back

felt Bell had opened up new areas that had escaped congressional scrutiny for many years. There was talk that some spin-off hearings might be held to determine the monopoly control and antitrust status of the Bell System.

Meanwhile, the so-called Phase II study of AT&T before the FCC included a February recommendation from an administrative law judge that Western Electric be divested by AT&T. No decision was reached by the FCC in the ongoing investigation into the reasonableness of AT&T rates.

And the Justice Department antitrust suit

against AT&T which also sought to dilute Bell's vertical monopoly spent virtually the entire year trying to decide whether the U.S. Court in the District of Columbia or the FCC had jurisdiction to hear the case As the year ended, the court finally decided it would hear the 1974 government suit, but no date was set for the start of discovery proceedings.

In August, the FCC reopened the Computer Inquiry with proposed definitions of communications processing that would allow AT&T and the other carries to offer more services tailored to data communica-

At an initial FCC briefing organized for the commission by the American Federa-tion of Information Processing Societies, it became clear that defining the boundary between non-regulated DP and regulated data communications would be a long and difficult task.

Initial comments on the proposed new definitions are due early in 1977, but few expected a speedy FCC decision. As part of the Inquiry, the FCC agreed AT&T could tentatively tariff an interstate version of its Dataspeed 40/4 CRT.

The terminal was classed by competitors as a DP device which therefore should not as a offered by a regulated carrier. But AT&T called it merely a device that had evolved from earlier Teletype models, ig-noring the fact that it could be clustered and that it handled binary synchronous communications just like competing intelligent terminals.

The continuing effort to finally allow the direct connection of noncarrier (customerprovided) equipment to the telephone network continued around a steady stream of AT&T-fostered roadblocks. At year's end, however, few independent suppliers had become part of the FCC's certification/registration procedure, and most users still had their units connected via the extra-cost Data Access Arrange-

IBM Asks Appeals Court to Nix **Catamore Request for Rehearing**

BOSTON — Catamore Enterprises, Inc.'s motion for a rehearing should be denied, IBM said recently in its response to the U.S. Court of Appeals for the First Circuit.

Although a jury awarded Catamore \$11.4 million from IBM in a breach-of-contract suit, the appeals court vacated the decision and ordered a new trial [CW, Oct. 4]. Catamore asked the appeals court to reconsider its verdict [Oct. 25].

IBM's brief, submitted at the court's

request, contained three allegations and refuted the user's charge of "invited error"—leading District Court Judge Raymond J. Pettine into issuing instructions to the jury which the appeals court found improper.
The Catamore brief contained many argu-

ments not previously presented which are "therefore not deserving of consideration for the first time in a petition for rehear-IBM stated.

The rest of Catamore's arguments, IBM claimed, "although sometimes camouflaged by different descriptions, have been

NEWS

previously presented, considered and reject-

The day after IBM filed its reply, Catamore filed a motion to strike much of the contents of the IBM repsonse. This was countered by a motion from IBM to strike Catamore's move to strike.

Calcomp Winding Up Its Case

LOS ANGELES - California Computer Products, Inc.'s (Calcomp) por-tion of its antitrust case against IBM should conclude between Jan. 15 and Jan. 18, according to estimates from its lead attorney, Max Blecher.

Although some observers accustomed to the interminable timetable in the U.S. vs. IBM antitrust case expressed surprise at the shortness of the Calcomp trial, Blecher said he is running two weeks behind his estimates.

Beginning the week of Jan. 3, Blecher

expects to introduce evidence, including IBM internal documents, on the plug-compatible portion of the case.

Jurors have heard three live witnesses testify on market share as well as excerpts of testimony from the U.S. case on the topics of market share, the com-

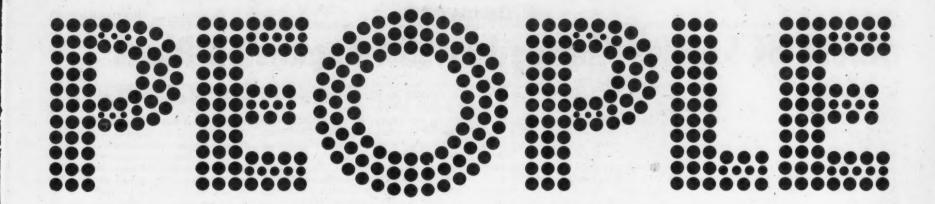
petitive situation and fighting machines.

During the week of Dec. 20, Max
Palevsky and Dan McGurk, formerly of Scientific Data Systems, testified on the difficulties of entering and being a force in the general-purpose systems arena.

On the Inside This Week

U.S. vs. IBM Marked by Speed, Snafus in Past Year Privacy Protection Hot Topic on Every Level in '76 Ruling Kindles Debate on DP Professionalism1 Program Patents Gaining Ground Vendors Spend Hectic Year Reacting to IBM Price Acts . . 1 EDITORIAL Editorial: Legal Penalties Citibank's Mini Approach Seems to Be Working . Taylor Report: Data Base Dangers Must Be Identified 1 SOFTWARE & SERVICES Maturity of Users, Vendors Set Tone Throughout Year . . . 1 FSEC Publishing First Catalog . On-Line DBMS Monitors Drug Addicts' Rehabilitation ... 2 THE HUMAN CONNECTION Training Goes to DPers, Users as Calif. Unit Adopts A/V . . 2 COMMUNICATIONS Increased Flexibility Marks '76 as Year of the User 25

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Take the article called, "A guided bibliography to sorting," by H. Lorin, which appeared in the *IBM Systems Journal*.* It contains the best description we've ever seen of what it takes to make a top sorting team:

"Developers of sort systems must be thoroughly familiar with the characteristics of the hardware of the sorting machine, they must be knowledgeable in program generation techniques, competent in program optimization and balancing methods, familiar with design technology and the operating system and I/O areas, as well as being competent sort specialists. In addition, since the performance of a sort is critical, a sort development team must be competent to undertake extensive prediction, analysis and test of their product's performance characteristics."

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*Volume Ten, Number Three, 1971.

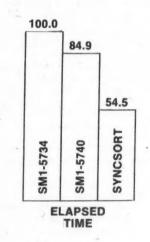
The last time this happened, we matched our SyncSort III-and-half against the Hardware Manufacturer's SM1-5734 and SM1-5740 (PEER/ICEMAN).

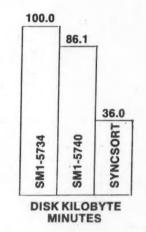
Frankly, the results weren't even close. IBM sent its own MF-1 monitor to evaluate the tests, and a human observer to make certain that everything was according to Hoyle. But all to naught.

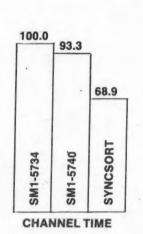
SyncSort performed better than the other two sorts in every category, as illustrated below:

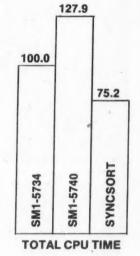
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Abuse of Studies Charg Expansion

(Continued from Page 1)
minimum of interference from Congress.

Studies of the SSA's utilization of equip-ment it already had began in 1975 and continued throughout 1976 in response to charges from inside the agency and on Capitol Hill that the SSA didn't really need more machines or buildings

GAO stated its analysis "indicated the 15 systems examined were capable of supporting more than twice the largest identifiable workload processed by the

In addition to these studies, congressional In addition to these studies, congressional concern was raised through hearings by Vanik's subcommittee and by Rep. L.H. Fountain's Subcommittee on Intergovernmental Relations and Human Resources; awarding of the construction contracts was delayed 30 days

Nevertheless, the SSA received approval on June 25 to go ahead with construction of its computer center from Robert E. Jones, chairman of the House Public Works and Transportation Committee.

Jones and his committee are "in the business of building buildings" and they believed SSA's stated need for additional

facilities, Vaughan said.
"Fountain's and Vanik's subcommittees believed the GAO and its utilization report. And it wasn't up to Oversight to stop the contracts for the computer center or for Metro West," SSA's planned \$96.7 million office building, he added.

Went Ahead With Plans

In the midst of this congressional face-off, SSA went ahead with its plans. On June 29, a \$37.5 million construction contract was awarded to a three-firm consortium and ground was broken on the 34-acre site on Aug. 31.

In addition, the second half of the architectural phase of the plans for the computer facility is under way, according to a spokesman for the GSA, the agency handling the building's construction.

Throughout the fall and into the winter,

the SSA renovated some 18,000 sq ft of space that will provide temporary housing for the four 168s.

The machines are now all in-house. Two of them began operation last Monday and the remaining two systems are scheduled to go up today, he added.

The SSA contracted with Mitre Corp. to further examine the agency's present utilization practices.

Begun in mid-November, this 15-month contract is intended to follow up on the

GAO's study which the SSA called "only an indicator of possible underutilization of computer equipment," a Nov. 17 letter from U.S. Comptroller General Elmer B. Staats to Fountain noted.

The SSA also agreed it would "initiate no

further significant computer acquisitions, including those proposed in the agency's 1977 budget, until the contract study is complete," according to the letter, which detailed the course of events since Fountain first seeked the GAO to look into the SSA first asked the GAO to look into the SSA in July 1975.

Vaughan noted that if the SSA does try to acquire equipment before the Mitre study ends in fiscal 1978, Vanik will go to the House Appropriations Committee to stop

this move until utilization is up over 50%.
The SSA also contracted with Dr. Herbert

AT&T Rebuffed in Bid To Limit FCC Power

(Continued from Page 1) phone industry have stalled the introduction of this program with objections to

several portions of it.

The AT&T fight against the interconnection of noncarrier equipment actually dates back to the first tariffs filed after the Carterfone decision which took effect in 1970. Bell initially claimed that harm would occur to the telephone network, but in various regulatory proceedings it was unable to convince the FCC that damages to the telephone facilities had actually oc-

AT&T is now looking to Congress for assistance with its proposed Consumer Com-munications Reform Act, which would eliminate the interconnection of noncarrier equipment based primarily on economic

A spokesman for the Independent Data Communications Manufacturers Association said that organization is "pleased with the decision. This should put to rest the question of whether the states can promuldivergent interconnection standards and thus retard technological advancement

and economic growth."

An AT&T spokeswoman said "the decision not to review was not in the best interests of the American telephone user. At this point, we don't know what action we

Maisel to develop the agency's staff. Maisel was previously director of the Academic Computation Center at Georgetown University and a former member of the team that studied SSA's Supplemental Security Income program and problems.

In addition to working to answer GAO criticisms of SSA staff problems, Maisel will serve as project officer for the Mitre project. He became a full-time SSA employee on Sept. 1, the GAO letter to Foun-

tain reported.

The GAO noted SSA personnel had habit of stopping the systems at shift changes. As of the end of June, the SSA intitated overlapping shifts for some 350 operations personnel to keep equipment running and to improve communications between employees on different shifts.

The GAO's contention throughout has been that the agency did not adequately evaluate the alternative of modifying and upgrading its existing facility, the letter

In August, the Council on Environmental Quality agreed with the GAO, stating "the modification of the existing computer facility was evidently a meaningful alterna-

Vaughan considers the matter of the new computer center "a lost battle," but added "the war is continuing." The GAQ stated that "since the construction contract for the gagney's headquarters expansion project agency's headquarters expansion project has been signed and site clearing for the computer center has begun, we plan no further work reviewing project alterna-



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A. Easton, Dir., Corporate Telecommunications, ICM Americom Inc.
A.A. Gravina, Pres., Cybek Inc.
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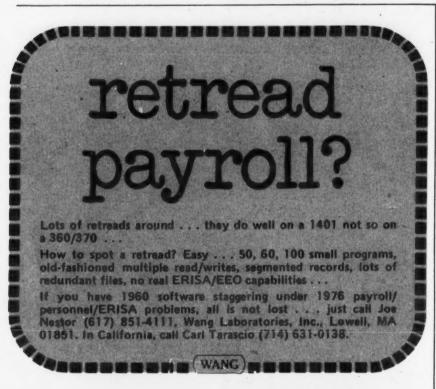
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U.S. vs. IBM Marked in '76 By More Speed, More Snafus

By Edith Holmes Of the CW Staff

The Department of Justice still hasn't started playing the hare in its presentation of the government's antitrust suit against IBM, but at least it gave up the role of tortoise in 1976.

By this time next year, Judge David N. Edelstein should have heard all the evidence the Justice Department plans to present. And when year-end 1977 rolls around, the court may even have had a look at IBM's

The Justice Department faces 1977 in the of attempting to prove its charges that IBM violated Section 2 of the Sherman Act by monopolizing and intending to monopolize the peripherals market. The new year will begin with 37 witnesses having taken the stand, nearly 35,000 pages of transcript making up the record and 226 trial days having come and gone.

Strength of Documents

In 1976, documents comprised the bulk of the government's case dealing with IBM's conduct in the marketplace. They also seemed to be the strength of the Justice Department contention that the corporation is a monopolist.

Between the opening of the trial in 1975 and this Dec. 2, the judge received 1,827 documents from the government, 740 from IBM and 22 from the parties together.

These documents, some 46 depositions also entered into evidence and the procedure which continued for the better part of the year — reading selected portions from these papers into the record — drove Edelstein from the courtroom in mid-July to the quiet of his chambers

While the judge returned for live witnesses and while he halted these reading sessions at the end of the summer by permitting the court reporters to simply type all designated passages into the record, he continued to stay away when documents were described, offered as evidence and objected to. Much of the trial in recent months thus went on

without his daily presence.

Lead IBM counsel Thomas D. Barr was also away from court in recent months. He obtained permission from Edelstein to be absent from the proceedings on a day-to-day basis to coordinate the private antitrust cases in Los Angeles with the government suit in New York and to manage IBM's claims of privilege for some 20,000 documents in the wake of a July ruling by the Second Circuit Court of Appeals that threw the question back to Edelstein.

Only lead government attorney Raymond M. Carlson remained in the courtroom virtually throughout the trial. He has frequently said he is eligible for retirement next November, however, so he may also exit the courtroom before very long.

Absent Principals

The absence of one or more of these principals from the daily trial reduced the num-ber of peripheral skirmishes that diverted attention from the issues in this trial ever since it started. While fewer games were played by Edelstein, Barr and Carlson in 1976, however, waste of time and money was not lacking.

Barr took two occasions, for example, to say at some length that IBM would have stipulated between 75% and 95% of the tes-timony presented by the government. At the same time, when the Second Circuit ruled on the question of protection for IBM internal documents, Barr admitted to Edelstein and Carlson that 30% to 40% of the contested papers weren't privileged or were so old or of such little consequence that the Justice Department could have

Great hues and cries were also raised when the Justice Department used agents from the Federal Bureau of Investigation to interview IBM witnesses and when Edelstein upheld the government's right to do

Nor did the Justice Department look very good when it called seven IBM good executives — including chairman of the board Frank T. Cary — to court to identify two documents and never had these men

A Look Back

take the stand.

For its part, IBM organized an unfruitful trip to Florida for the parties and the judge to take the testimony of a retired IBM ex-ecutive said to be unable to travel to New York. Incurring Edelstein's wrath by failing to complete the testimony, IBM will have to bring the executive to Foley Sq. anyway.



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OMPUTER ASSOCIATES

SEC Charges DP Played Ro

the preparation of bogus inventory tags which were inserted into the reporting system.

At the time, Cenco was carrying inventory valued at \$40 million on its books.

In an attempt to determine how much of In an attempt to determine how much of this inventory was actually real, the firm used its computer to compare the actual inventory with what was carried on the ledgers "and computer listings were generated reflecting this approximation." The listings revealed the inflated inventory exceeded the real inventory by about \$28 million the SEC said in its filing.

million, the SEC said in its filing.
"Utilizing this information, a computer program was prepared which produced computer listings reflecting the determination of inventory items" which had been inflated, according to the complaint.

'Additional computer listings were prepared to be used in connection with a scheme to create the appearance that inven-

tory which in fact did not exist had been physically destroyed pursuant to a well-organized and highly accurate destruction program," the complaint added.
Under the guise of destroying the nonexis-

tent inventory, special computer codes were made up for the nonexistent stock, the SEC

Some of the defendants went personally to various remote warehouses of the firm and ordered certain real inventory to be tagged with the numbers for the nonexistent inventory and then shipped to the central warehouse here in Chicago.

After the inventory arrived at the central warehouse, it was apparently retagged with real inventory numbers and then shipped back to the warehouses from which it had

originated.
At the same time, the officers of the firm showed its accountants "documents which purported to reflect the results of a physical count of inventory items, the shipment of those items to a central site, the receipt of those items at a central site and the compacting, baling and removal of those items by scavenger services," according to com-

plaint.
"These documents purported to substantiate the destruction of about \$16.3 million inventory... The documents were

In addition to the charges of covering up false inventory, the SEC complaint also indicated Cenco's computer system was used to inflate the firm's 1973 sales.

Cenco's "consolidated financial statements [for 1973] were materially false and misleading due to the inclusion of about \$2 million of ... sales which were false and constituted a duplicate recording of sales effected in the markh of August and Neurons. fected in the months of August and November 1972," according to the complaint.

To do this, "false sales listings were created, utilizing a special computer pro-gram which was designed to generate from

the computer duplicates of portions of the August and November 1972 sales listings with changes made in the shipment dates," the complaint charged.

Bell's Firm Works On Cases for IBM

(Continued from Page 1)

Times Mirror Co. and Beckman Instru-ments. He is a fellow of the American

Academy of Arts and Sciences.
Also last week, Carter named Patricia
Roberts Harris, a black woman, to be the
Secretary of Housing and Urban Development, although it had been widely rumored
that she would land the Attorney General

A director of IBM since 1971, Harris is a partner in the Washington, D.C., law firm of Fried, Frank, Harris, Shriver & Kampelman.

Previously, she was an attorney in the Department of Justice, a dean of Howard University Law School and U.S. Ambassador to Luxembourg. She headed the credentials committee at the 1972 Democratic Convention and is a director of Chase Manhattan Bank, Georgetown University, Scott Paper Co. and the National Associa-tion for the Advancement of Colored People (NAACP) Legal Defense and Educational Fund.

Carter's earlier appointment with IBM ties was board member Cyrus R. Vance, named as Secretary of State designate. Vance is a partner in the New York law firm of Simpson Thacher & Bartlett and served as General Counsel and Deputy Sec-retary of the Defense Department as well as

Secretary of the Army.

Vance, in addition to serving on the IBM board, is also on the boards of Pan American Airways, The One William Street Fund, Inc. and The New York Times Co. and is a fellow of Yale University.

He became an IBM director in 1969 and is president of the New York City Bar Association and chairman of the Rockefeller Foundation.

IBMers as Close Advisers

In addition to four people with IBM ties nominated to Cabinet positions — out of a possible 11 — other IBMers are also close advisers to the President-elect.

Irving Shapiro, chairman of E.I. du Pont de Nemours and Co., asked the President-elect not to nominate him as Secretary of the Treasury. Shapiro, an IBM director since 1974, is also president of the powerful business lobby in Washington, the Business Roundtable.

Although he declined an official post in the Administration, Shapiro still is a close adviser to the Carter camp on business

Like Shapiro, another IBMer - former IBM Vice-President Jane Cahill Pfeiffer — asked the President-elect to remove her name from Cabinet consideration just at the time it was almost assured she would land the job as Secretary of Commerce [CW, Dec. 20].

Frank T. Cary, IBM chairman, has also met with the President-elect on matters of importance to the business community.

Another IBMer with the ear of the President-elect is Dr. Lewis A. Branscomb, IBM vice-president and chief scientist, who has been advising Carter on science and technology policy. He stands a good chance of being named science adviser to the President in the new Administration.

dent in the new Administration.

IBM last week said there was no requirement in the firm's bylaws forcing it to re-place the board members if they do leave the IBM board of directors to take the Cabinet posts.

And in a personal note IBM Chairman Cary said "we are pleased that three mem-bers of our board, who have distinguished themselves in many endeavors, have been selected to serve in the new Cabinet. We wish them well."

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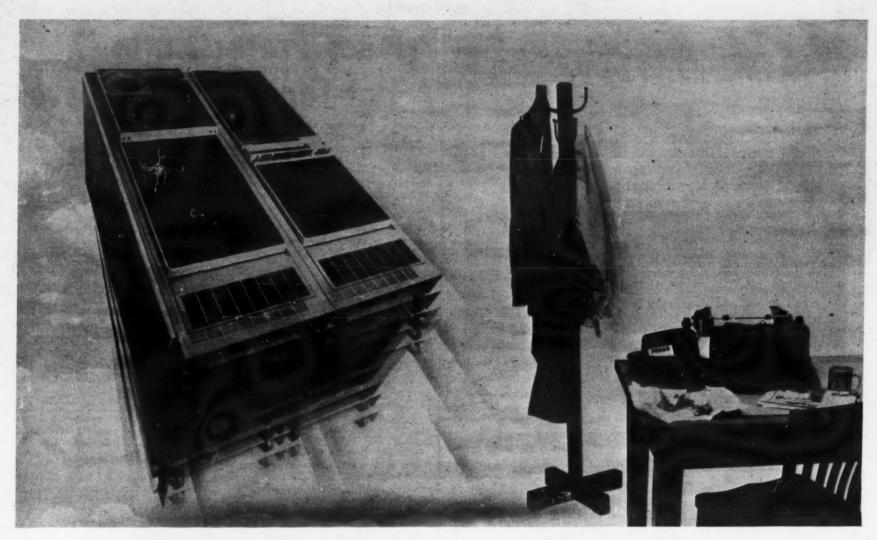
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Privacy Protection in A Hot Topic on Every Level

Of the CW Staff

As the Privacy Protection Study Com-As the Privacy Protection Study Com-mission began to deliberate in 1976 over what steps private industry should be required to take to protect personal privacy, the spotlight focused on the actual practices of big business. It was not a pretty

Under its glare, most companies found it difficult to conceal that many privacy abuses were the result of standard operating procedures rather than merely being "isolated incidents" of "computer errors."

At hearings at the end of February, witnesses for American Express, Sears Roebuck and Co. and the Bank of America testified they routinely provide information about customers' charge accounts to creditreporting agencies, government agencies and even private attorneys without first informing their clients.

In many cases, that information was used by subunits of the firms that had shared it and by other retail or banking outlets to solicit customers for services and merchandise the customer never even expressed in-

terest in obtaining.
Rejections for loans, which could be damaging to a person's credit reputation, could be "deduced" from a look at a creditreporting agency's record on an individual, a bank executive told the commission, admitting that a bank's decision not to make a loan is often based on the bank's financial situation rather than the customer's

Testimony also revealed thousands of in-dividuals do not buy life insurance or take advantage of health insurance benefits for which they are entitled because they fear where information they provide will go.
Individuals who have filed claims to help

pay for treatment of venereal disease, a heart attack or psychiatric counseling, for example, have found this information disseminated without their consent. As a result, many have lost seemingly unrelated privileges such as auto insurance.

Major Customers

It was also revealed that the Federal Government, unbeknown to the average citizen, is one of the major customers of the

credit-reporting industry.

The Veterans Administration and the
Civil Service Commission use creditreporting agencies to verify claims and determine eligibility for benefits and suitability for security clearances.

The Federal Bureau of Investigation (FBI) and local law enforcement agencies use telephone toll records, credit investigatory reports and other credit information without court orders, according to Bella Abzug, who told the commission her information came from hearings conducted by the Government Operations Committee's Subcommittee on Government Information and Individual Rights.

Following these disclosures, many organizations hastened to announce policy changes to protect individual privacy that were widely reported in business news sections of the nation's newspapers.

The commission is nearing completion of its hearings on privacy abuses, but notably absent from its scrutiny have been privacy standards for criminal records as well as use foreign governments and organized crime. No progress was made on Capitol Hill on

a law that would have provided protection for criminal records.

Faced with an uphill battle for reelection, Faced with an uphill battle for reelection, Sen. John Tunney (D-Calif.) —, chairman of the Senate Subcommittee on Constitu-tional Rights, apparently placed his criminal records privacy bills on the back burner as a result of pressure from newspa-per interests in his home district who believed such a law would limit their access to criminal data.

His defeat in the November elections by S.I. Hayakawa left up in the the air where that subject will go next year.

On a local level, law enforcement agencies

A Look Back

moved to put into effect the privacy and security regulations issued by the Justice Department to fill the legislation gap.

One of Hottest Battles

And in Washington, a federally controlled computerized message-switching system, proposed by the FBI, stirred up one of the hottest battles of the year.

While the FBI lobbied within the Justice

Department to get approval for the system from Attorney General Edward H. Levi, the White House Office of Telecommunications Policy, a number of congressmen and many local law enforcement officials battled against federal control of the com-munications network that would serve local

At year-end, Levi, by then a lame-duck Attorney General, had made no decision on the matter.

Privacy advocates were also active on the state level. The fruit of their work was seven fair information practices laws — most of

which apply only to state agencies.

Minnesota, Massachusetts, Utah, ginia, Connecticut, Arkansas and Ohio have laws, and California Gov. Jerry Brown recently issued an executive order with the power of law.

Though only two years ago the Privacy Act of 1974 permitted individuals to withhold the Social Security number if they chose to do so when doing business with a federal or state agency, the Tax Reform Act of 1976 gave back to the states the right to require that number for use in driver licens-

ing, driver registrations, public assistance and parent locator programs. In September 1977, the Privacy Protection Study Commission must recommend standards for personal recordkeeping in the private sector to Congress in a formal

Some believe the commission will ask for voluntary compliance or laws to correct abuses in specific areas rather than an omnibus act. This remains to be seen.
What is certain, however, is that existing

legislation has not settled the question of who owns an individual's personal information — the individual or the organization that maintains it.



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Ruling on Programmers Kindles Debate on DP Professionalism

By Catherine Arnst

Of the CW Staff
In 1971, the U.S. Department of Labor decided programmers should not be considered professionals and thus should receive overtime pay under the Wage and Hour Laws [CW, Feb. 16, 1972].

In 1976, a federal court judge in Tennessee reaffirmed that programmers cannot be considered executive, administrative or pro-fessional personnel and therefore must be

paid overtime [Feb. 9].

If a programmer is not a professional, then who in DP is? In 1976 that question eclipsed the previous year's licensing con-troversy, at least in the professional

Last year at this time, Kenniston W. Lord Jr., then president of the Society of Certified Data Processors, claimed the licensing bill his organization had introduced "accomplished what we set out to accomplish" — draw attention to the need for a national set of standards directed toward the performance of DP people

A Look Back

rather than systems [CW, Dec.31-Jan. 5].
"Licensing was never the issue; professionalism is the issue," he stressed.

In the court case in Tennessee, professionalism became a legal issue. During that trial Judge L. Clure Morton compared programmers to draftspeople.

'A draftsman is mechanical, he's covered by the Wage and Hour [Laws], even though he uses his mind, even though he points out where an architect makes mistakes [and] points out where the professional blew it, Morton said.

A programmer serves the same function, the judge said. "Of interest is the fact that a programmer does not need the expertise of the designer, need not know the inner workings of the computer and can do adequate work with only a general familiarity of its function and a grasp of computer

language."
Dr. William H. Rowan Jr., a professor of systems and information sciences at Van-derbilt University, testified at the trial that programmers are professionals because they usually do a lot more than program-

Rowan's criterion for a "DP pro-fessional" is someone who has completed a college-level computer science program that follows the 1968 guidelines issued by the Association of Computing Machinery

Unlike the past, it is going to be very difficult from now on to acquire knowledge

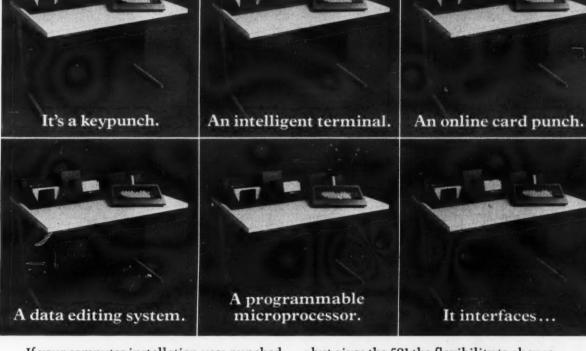
while moving up through the ranks, he said. Professionalism is a major concern of both the Association of Computer Programmers and Analysts and the Institute for the Certification of Computer Professionals (ICCP).

Although a pure programmer is closely analogous to a draftsperson, according to Martin Morris, an officer of both those organizations, "in 10 years those types will be on the way out; there will be no programmer job title." The issue will then be

The ICCP, which sponsors the Certificate in Data Processing (CDP) examination, is trying to address the "programmer as professional" question anyway with a CDP test for senior programmers [CW, Dec. 20]. The CDP test is normally aimed at DP

managers, but the institute is venturing into

the certification of programmers for 1977.
The professional societies are carrying the banner in the movement toward a defini-tion of DP professionalism, but the rank and file are not very active or interested, Morris complained.



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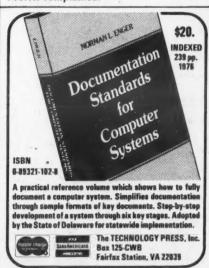
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Despite High Court Ruling Program Patents Gaining Ground

Of the CW Staff

Patents for deserving software seem to be more "acceptable" now than they were a year ago even though, at mid-year, the U.S. Supreme Court overturned a decision by the Court of Customs and Patent Appeals (CCPA) which had been in favor of a software "inventor."

In its reversal, the high court found the software "apparatus" for which Thomas R. Johnston sought a patent contained nothing that was not "obvious" from the prior art.

While attorneys may disagree with that decision, they generally agree the court did not challenge the CCPA's finding that software presented as "apparatus" is en-titled to protection under the Patent Act if meets all the usual challenges.

During November, the CCPA reiterated

its basic contention that software is patentable and made the point doubly clear by reversing the U.S. Patent Office's appeals board on two separate and distinctly dif-ferent cases on the same day.

Deliberate Double-Header

For inventor A. Michael Noll of Bell Labs, the CCPA ruled an improved raster scan computer graphics system was indeed new although the hardware involved was

A Look Back

well known because the software behind the system was unique and unobvious.

Glen Chatfield won CCPA acceptance of his claims for the "Regulator" software which monitors and dynamically modifies the flow of application programs through a multiprogramming computer. The inventor's advocates successfully argued that Regulator provides a method or process of operating a computing system and is therefore patentable material.

The CCPA apparently was looking for

just such a double-header covering both "apparatus" and "process" claims. The Noll application had been sent to the CCPA on Oct.1, 1973 and held, in the view of several observers, until just such a combination of claims could be decided at the

Even the clerk's office at CCPA volunteered the thought recently that Noll's appeal had been held "an awfully long time" and such a delay was "certainly unusual."

Gamble for CCPA

The CCPA justices apparently wanted to The CCPA justices apparently wanted to get the Johnston case out of the way, even gambling that if it was appealed the Supreme Court might overrule them on "obviousness" but not disturb the basic finding that software couched in "apparatus" terms is patentable.

Once Chatfield's appeal came along and offered CCPA a strong case based on a "process" claim, the justices packaged it with Noll's and moved the pair to decision. The vote in each case was 3-2 in favor of

The vote in each case was 3-2 in favor of the inventor, but different groupings of the justices accounted for the tally in each case.

Dissenters Ask 'Higher Authority'

The court seemed rather more in agree-ment on Chatfield than the vote suggested. A "dissenting" opinion filed by two judges held no real disagreement with the majority

Instead, it contained an appeal to a "higher authority than this court" to settle the question of patent protection for software so all concerned can move forward

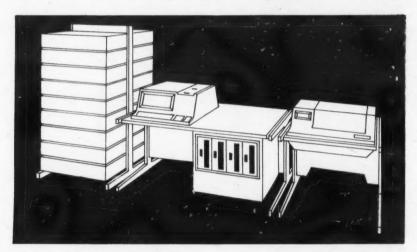
from a common base.
It is possible, observers feel, that CCPA Judge Giles Rich wrote his dissent just to provide the Patent Office with a vehicle by which it might seek a review of the case — and the basic problem — by the Supreme Court, the only body which he would recognize as a higher authority than his own court.

The Patent Office has not yet decided whether to seek such a review of either Noll or Chatfield by the Supreme Court.



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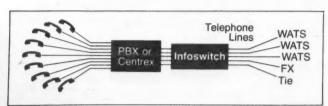
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Vendors Spent Hectic Year Reacting to IBM Price Acts

By Molly Upton Of the CW Staff

IBM both raised and lowered its price umbrella in 1976, and other mainframers reacted in similar ways. The fallout to users was higher maintenance fees and reduced prices on mid-range CPUs.

IBM sounded the first salvo in late May

IBM sounded the first salvo in late May with reductions ranging from 4% to 35% on various memories.

Amdahl Corp. was the only one to immediately pick up the challenge, and it reacted by slashing its memory prices as much as 38%. Amdahl also included a price hike on its CPUs, so the average price reduction was 5%, with greater reductions on systems with larger memories.

Early in July, IBM celebrated the Bicentennial Fourth by unveiling the 370/138 and 148, which represented significant price/performance improvement over the 370/135 and 145. For example, the purchase price of a 135 with 512K was \$601,500, but a 1M-byte 138 cost \$435,000.

In their retaliations, many mainframers said they could offer lower prices because of the use of 4K memory chips. But many in the industry could not help wondering if they would have been so quick to pass on those savings to the user if IBM hadn't provided the impetus.

Late in August, Univac dropped prices on its Series 90 machines. The 90/60 emerged as the warrior against the new 370 models; its memory capacity was increased and its price reduced.

A 512K-byte 90/60 that formerly had a \$486,896 price tag was offered with a new IM-byte memory capacity for \$377,784, edging under the \$435,000 IBM was charging for its 138.

ing for its 138.

In September, Burroughs cut main memory prices on its B2800, B3800 and B4800 by 19% to 37% on purchased memory and by 8% to 21% on leased modules. It also increased the memory capacity of its B2800 and B3800.

Honeywell Information Systems, Inc. (HIS) in early October said it had increased the performance of its Series 60/Level 66 batch-oriented mainframes with no increase in price. HIS also announced multiprocessor capabilities for the 66/05 through 66/80.

The price spread on 1M-byte systems by October was generally less than \$100,000.

Other Price Changes

But CPU price changes, many of which were effected principally through lower memory prices, were not the only price actions during 1976.

IBM's Term Lease Plan cut monthly lease charges 9% below those of the Monthly

Hobbyists in Boston Getting Radio Show

CAMBRIDGE, Mass. — Computer hobbyists will take to the airwaves with their very own radio show beginning Jan. 22.

Believed to be the first radio series of its

Believed to be the first radio series of its kind, "The Computer Program" will be broadcast on WBUR-FM, a noncommercial radio station with a 100-mile radius in the Boston area.

The format of the show will feature a guest who will speak on a topic of his choice and answer questions from listeners, according to Richard Gardner, host and originator of the show.

The program will also include news items of interest to the home computer hobbyist and a weekly announcement of resources related to the speaker's topic.

The program will be available to other stations and parts of each program can be broadcast as separate programs.

Further information can be obtained from Gardner at Box 134, Harvard Sq., Cambridge, Mass. 02138.

Availability Charge.

Regarding maintenance, IBM was the first to announce price hikes, which it did in August. IBM said it would hike contract maintenance prices 5% to 15% on sold gear effective Nov. 16. In addition, it raised hourly service rates and systems engineer-

A Look Back

ing fees by 15% effective in August. In September, HIS rallied with price hikes of 7% to 15% on its maintenance.

Univac indicated recently it will raise maintenance prices 5% to 15% principally on nonactive products, effective Jan. 1.



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LBR and Beta COM—and 3M's full range of software and support services.



Editorial

Legal Penalties

Many of the trends emerging in data processing are making it more and more inviting for computer-related crime to flourish.

As more valuable information finds its way into DP storage, the attractiveness of theft becomes a definable risk for the knowledgeable criminal. And as the potential rewards for unauthorized access of data go up, it is inevitable that organized crime will begin to examine the possibilities.

Cases such as the laundering of bad credit files by a ring of persons on the West Coast will soon become fumbling initial forays when seen in retrospect in a few years.

Just as bank embezzlers have been caught altering books, we may soon hear of multinational alterations in DP accounts that could cost corporations (and entire economies) huge sums.

These types of crimes will not have any James Bond blood and thunder associated with them. They will be accomplished by skilled DPers who have detailed systems expertise. And it is conceivable that some of these potential criminals will have helped to design security into the very systems that are violated.

As distributed DP concepts spread responsibility outward, the potential for compromise also increases. In such environments, the importance of security increases, too.

But warnings about DP security are nothing new to the DP industry and its users. The problem is that DP crime is still regarded by the rest of society and the legal system as an event that almost deserves envy.

There is little in the law about violating the rights of unsuspecting third parties with the unauthorized theft of DP information. Unauthorized access is even a difficult event to prosecute, depending on what is accessed and what is done with the information.

Perhaps it is time that a stronger legal deterrent be established against the violation of DP systems for unlawful gain. One of the major deterrents against homicide is that the punishment often exceeds the desire to commit the crime.

If we are sophisticated enough to breed experts on computer crime who study such things, we should also give some thought to setting up a proper framework of legal safeguards.

Taking such steps after a monumental DP crime has occurred will only show the present study of DP crime has been a futile effort.



Letters to the Editor

The Controversial Dead Horse Has Taken a Sufficient Beating

In regard to the current controversy over appropriate date conversion methods, I think the dead horse has taken a sufficient beating. I would prefer to look at the expression of a relative date in the same manthat Edsel Murphy used when expressing velocity

To quote the publication "The Contributions of Edsel Murphy to the Understanding of the Behavior of Inanimate Objects" under Section II (General Engineering):

Dimensions will always be expressed in the least usable term. Velocity, for example, will be expressed in furlongs per fortnight."

Perhaps the American National Standards Institute could be coerced into developing such a method of measuring time.

Detroit, Mich.

Greg Faubert

Correction of First Impression

In the article covering my talk at Las Vegas ["IBM-Amdahl Pact Has User Implications," CW, Nov. 8], I was reported as saying the cross-license agreement with IBM would provide a measure of protection. Perhaps I did not state the value of the cross-license

agreement properly. The agreement in fact provides a measure of protection for Amdahl users in that IBM patents for its future systems could not prevent Amdahl from producing a compatible system.

With respect to the item on "stymicing court ac-

tion," I do not recall making such a statement in the context of a patent cross-license agreement, but rather with respect to a question about IBM taking specific actions to quash Amdahl's business ac-

> Gene M. Amdahl Chairman

Amdahl Corp. Sunnyvale, Calif.

Five Years Ago Dec. 29-Jan. 5, 1972

Data Past

WASHINGTON, D.C.—The Federal Communications Commission (FCC) told AT&T to justify the need for Direct Access Arrangement (DAA) interconnection devices. The DAAs were branded "discriminatory" by the Independent Data Communications Manufacturers Association.

The association, in an informal complaint to the FCC, charged the DAAs discriminated against users who provided their own modems and other noncarrier equipment

The FCC indicated that unless some DAA requirements were shown to be technically necessary, the commission would take action in the public interest.

Eight Years Ago Jan. 1-8, 1969

WASHINGTON, D.C. - A precompiler written in Cobol was released in conjunction with the Navy standards test program for compilers. The precompiler saved users both computer time and money by reducing the number of compilations necessary to complete a Cobol program. The predicted effect of such compilers was improvement of the overall working efficiency of the programming industry without sacrificing needed machine and man time.

SANTA ANA, Calif. — A remote terminal system was announced by Data Computer Systems. The unit, "the first fourth-generation remote communication terminal," provided remote capabilities for keyboards, card readers, printers and punches over voice-grade lines

The system, called the CP-4, could be interfaced to any standard modem, provided operating speeds up to 240,000 bit/sec and operated with line printers at 315 line/min.

The price of the system ranged from \$29,000 to \$42,500.

smelborP retnirP suoireS

In his letter [CW, Dec. 13], Stuart R. Sheedy sugdemaner eb dluohs sretnirp lanoitceridib taht detseg "boustrophedon" printers and we agree completely. smelborp suoires gnicneirepxe era ew ,yletanutrofnU with our printers, and nomenclature is the least of ?gnorw gniod ew era tahW .seirrow ruo Stephen E. Wright

J.N .notecnirP

Clarifying the Point

The Nov. 22 issue contained an article with my by-

line. This article had a misquote in it.
It stated Entrex and Keydata could not keep up with the speed required by our firm. In the original article 1 sent to Computerworld, neither vendor's name was mentioned.

The statement was to the effect that Entrex and Keydata could not guarantee they could keep up with the speed required. This has caused us consternation, as well as Entrex and Keydata.

Alan W. Hawkins

Director of DP

McKee Baking Co. Collegedale, Tenn.

(Other letters on Page 18)

Computerworld welcomes comments from its readers. Letters should be addressed to: Editor, Computerworld, 797 Washington St., Newton, Mass. 02160.



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Citibank's Minicomputer Approach Seems to Be Working

By Joseph T. Rigo

al to Co

We have all heard about Citibank's massive conversion to minicomputers. We are now beginning to hear the rest of the story and it involves a lot more than hardware.

In somewhat oversimplified form, the current situation was recently described

· Citibank, one of the world's largest corporations, is junking all its big IBM mainframes.

• It is replacing its big machines with minis - dozens of them, of every make and model.

• It has drastically reduced its permanent systems and programming staff. For new development, it rents consultants for as long or short a time as needed.

used to take two to five years to design and implement a new system. Now the bank is getting the job done in as little as six weeks

Approach Working

The important thing about all of this is that it seems to be working. It is not an experiment any more. The bank clearly feels its approach is paying off in cold, hard, business terms.

R. Max Gould, a Citibank vice-president, described the bank's current approach to DP at a recent Association for Computing Machinery (ACM) meeting in

The impressive thing about his talk was that he made everything seem so logical. It came across as the only sensible way to do the job. He left little doubt that this is the way we are all going to be working in the future.

There is only one catch. Before we can follow the new Citibank approach, we are going to have to learn how to do things the way Citibank was doing them five

That's where most of us are now. We are learning to work with multiphase life cycles.

Every company has its own version of the life cycle, but they all have a few things in common. They break the long development process into manageable chunks. They also keep an eager development team from taking shortcuts that lead to disaster.

Citibank mastered the life cycle. In doing so, it found out where it was safe to take shortcuts. It found out which projects need all the administrative bells and whistles and which ones should be

systems people at the corporate level have to prove that the bank's overall approach to DP is cost-justified.

Yes, they recognize that a dozen different groups may be developing essentially identical systems. And, yes, they know there will be a failure every now and

Within limits, they don't care. They argue that the total cost for a complete minisystem is so small that they can lose a few, and it's still cheaper than doing things the old way. Gould functions as a chief internal con-

sultant. He and his staff work with the

multinational corporation

Gould's talk was to the New York City Chapter of the ACM Special Interest Group for Systems Documentation. So, naturally the question of documentation came up. It came as no surprise that Citibank has disposed of most of it.

• Most new systems are terminal-oriented, so user documentation is built into the system as much as possible. Informais displayed at the terminal when needed.

The computer operator gets whatever run documentation is needed.

The biggest emphasis is on preparation of a thorough functional specification. It describes the user's requirements and it goes on to include program specifications.

Gould said he is currently preparing a standards manual. It will supply the minimum guidance necessary for consistency within the corporation.

There is some program documentation, he said. But he indicated that if maintenance becomes a problem, it may cheaper to call the consultants back to

build a new system. One of the most impressive things about Gould's case was the way he presented it. There were about 50 people present and maintained a constant questions. In fact, it was more like a press conference than a speech.

Many of the questions were downright hostile, but Gould fielded all of them with good humor.

This was not a person who was nervously defending an interesting new theory. He was on rock-solid ground and he knew it. He was graciously telling us about how his company is doing things these days. We could listen or not

Anyone want to buy a slightly-used ten-phase development life cycle?

Rigo is president of Sysdoc, Inc. in New

Reader Commentary

left alone

It appears that Citibank's new approach was in response to several factors:

 Systems were coming in more or less on time and within budget, but the designs were two years out of date. The world had changed while the system was being developed.

• The centralized staff was under pressure from the users who wanted greater control over their own systems.

New technology - the mini - made

major change possible.
As Gould described it, things are now somewhat as follows:

entire corporation has organized itself into separate groups for different types of customers. There are groups for the petrochemical industry, the real estate industry, retail consumers, etc.

Each group has, in effect, its own DP department. A group manager can buy his own computer, rent his own consultants and develop his own systems.

The manager of a group has the burden of proving that his great new system is cost-justified. In addition, the surviving

group managers. He recommends consultants and design ideas. He gives guided tours of a room filled with different types of minis to help the manager select for his own application.

Gould spends most of his time with big projects. These include applications such as funds transfer. They will be implemented by consultants on minis, but they still must adhere to all 'the life cycle paperwork.

He gives a little time to medium-size projects. As the classification suggests, these projects are exempt from some of the life cycle controls. But they represent sufficient risk to the bank that they require some corporate attention.

For a small system, the group manager

has a completely free hand. In fact, he may have trouble getting attention even if

he wants it.

Basically, Citibank is betting that its group vice-presidents are at least as smart as the guy who owns the candy store in the lobby. If the candy store owner can have a mini for his accounts receivable, so can the head of a major division of a

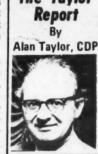
Dangers of Using Data Base Two columns recently dealt with the

problems of data base files - the first gave the theory that there are specialized problems and the second cited a specific case, the distribution of Master Charge Checks by Shawmut Bank in Boston.

Judging by the response, it seems that what actually hap-pened to the data The Taylor

file in the Shawmut case is still not clear - so let's take another look at it.

On the surface, a book of "negotiable instruments" (i.e., checks) was sent unrequested and unannounced by ordinary mail, to a former Shawmut Master Charge This user.



happened despite the standard banking practice that such documents are considered security paper and are only to be handled with easy audit trails that are able to pinpoint who is in possession of the checks.

The Basic Problem

The data file record was composed of many fields, but we only need to concern ourselves with the following:

- Name: T.K. Christo
- Address: 36 Beacon St., Boston, Mass
- Customer closed account?: (Nonexistent field).
- Date of last activity: June 1976 Of these three fields, what can we see that can lead to a security breach?

False data is the basic problem of all data base data file operations. The key question is: Which field is vulnerable to

have false data? Unless a clear answer of "none" can be given, the file itself can forestall unexpected problems that have nothing to do with the programming or design of the programs that access it.

In this case, our old friend Gigo has raised its ugly head again — with the very computer file in our own data base being the Garbage In part.

Clearly, the name field will normally be correct. A marriage change, for example. may make a different name equally valid or even preferable, but the name shown in the file will still be usable.

'Halo' Effect

The address field is a different kettle of fish altogether. True, there is a "halo" effect at the time of an address change which sees to it that mail is passed for ward sooner or later. But at best, this address-change halo only lasts about five or six weeks – long enough for the first monthly bills to be forwarded and the change to get reported for active accounts, but not long enough to cover nonactivity between June and November under any circumstances.

address field – not the name is what should have been noted as being vulnerable in the Shawmut files And this is what seems not to have been realized, when people objected that there was nothing wrong with sending the checks to former cardholders.

In this case, the checks were sent to an obsolete address and that is the problem. The address in the Shawmut files is, in fact, only as good as the latest activity

Shawmut used required addresses that were correct to within the halo period - certainly to within two months in the case of canceled memberships. The risk of

using less-accurate data was that the checks would be dispatched in easy-to-identify envelopes to addresses which may or may not be correct.

In any case where the address was not correct, there was no way in which the system would be self-correcting. Unlike statements which when missing sooner or later make the cardholder and/or the bank suspicious, missing distributed checkbooks don't call for any immediate action on either side. The bank doesn't expect all its cardholders to use them, so nonactivity gives no information. recipient doesn't expect to receive them. so nonreceipt raises no questions.

Hence, the stage is set for real, or hoax, interception of the checks because of the failure of the data base address field to contain known-valid information.

Now, of course, the programmer who specified the mailing program could have corrected it. He could have specified that the file should look at the last activity, and if this was longer than two months, it should be eliminated from review

I don't think this was practical; the number of eliminated cases would have been too large. This is a typical hindsight alibi. Where the data file is incomplete and does not record a customer's notifications of account closing, I don't see any that the application programmer can do

What he needs is some way of knowing what the fields really are giving him before he can be saddled with the responsibility for writing the applications that use the data base properly. If he had known the addresses could be months out-ofdate yet still went ahead and sent out the checkbooks then it would have been his

fault. But I don't believe for a moment that this information was brought to his attention during the development of the

Must Be Identified

mailing program.

Nor do I believe the programmers and analysts who originally described the files were at fault in failing to include fields beyond those that they needed to handle their own applications. They did not need to consider obsolete addresses or customer closings – these were self-correcting situations. There is little chance that one of their tasks would be to foresee that someone might sometime use the data base file for some other activity that made this important. So they, too, must be held faultless.

The problem of vulnerable data is simply and solely that of the data base concept itself. It is, therefore, the responsibility of the data base people to set things right - not to push the problem and the associated costs onto the data base users or the data base file providers. This is a data base problem which is too often not recognized as such.

Suggestions, Anyone?

Is there a solution? I think so and I referenced one in another column when I talked about the missing three-letter word that we may have to add to our vocabuas to handle the situation.

Again, I don't have any space to write about this particular solution now. So, if any of you have solutions that you would like to suggest or any other comments on the matter, I'd be pleased to hear of

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Letters to the Editor

Rigo Very Far Off Base; Van Duyn Right On Target

For the past year or so, I've been reading articles by Joseph Rigo relating to what it takes to be an effective documentation specialist in the computer field.

Having personally been in the computer and documentation fields for nearly 20 years, I marveled at how someone could speak so positively and with such au-thority on the subject and be so far off base with what the problems and solu-tions of technical documentation really

At one point I attempted to correct some of his wrong information by writing an article on documentation [CW, April 12], hoping to present some of the real problems that a technical writer encounters. But Rigo's articles continued to appear regularly.

It was with special delight that I read Julia Van Duyn's article ["Glibness Called No Way to Help Novice Tech Writer," CW, Dec. 6]. I agree with most of her ideas on technical documentation and wholeheartedly agree with her observations of Joseph Rigo.

Hopefully, where I failed, by my article, to curtail Rigo and establish a meaningful level of discussion on technical documentation, maybe Van Duyn's more direct approach will succeed. I certainly hope so. Harold Schmardebeck

Springdale, Ohio

Cobol Structures Deficient

agree completely with Larry Kintisch [CW, Dec. 6] about the desirability of in-line block structures in Cobol. Topdown, structured or goal-directed programming requires a language which supports completely nestable block-oriented

control structures

Although Cobol gives the appearance of having the necessary structures, they are deficient primarily bécause of a complete lack of statement bracketing facilities (i.e., the DO-ENDDO to which Kintisch

In a true block-structured language, any "block" (e.g. a single statement) can be replaced by any other block (e.g. "if condition then statement1 else statement2") at any level of nesting without disturbing the surrounding code. This is where the true payoff begins – in terms of reduced maintenance costs.

The control structures which make this possible for Cobol programmers are available; they are implemented through the Scobol preprocessor which translates a program written in Scobol into a semantically equivalent Cobol program.

The extended control structures provided by Scobol include WHILE-DO-ENDDO, ITERATE UNTIL-ENDITER, REPEAT-UNTIL, IF-THEN-ELSE-ENDIF, SELECT CASE-ENDCASE, POSIT-ADMIT-ENDPOSIT and QUIT BLOCK.

The precompiler is itself written in Scobol (and in the resulting Cobol) and can be implemented on any system with an ANS Cobol compiler,

For additional information, write to me at Software Consulting Services, 901 Whittier Drive, Allentown, Pa. 18103.

Martha J. Cichelli

Allentown, Pa.

Always on a Sunday

In response to James Hammill's question [CW, Dec. 6] concerning a method for figuring out what date Easter will fall on for the 10,000-year interval beginning with the year 0000, we cannot divulge the method or the date but we are at liberty to announce our computer's findliberty to announce ou.
ing for that day to be Sunday.
Steve Ferin

Cedar Rapids, Iowa

Time-Tested Technique

To supplement the interesting article by Peter F. Klammer and the letter from Joseph W. Begasse [CW, Nov. 22], the Julian day and system were not named in connection with the Julian calendar, but were named by its progenitor, Joseph Justus Scaliger (1540-1609) in honor of scholar father, Julius Caesar Scaliger (1484-1558).

And to further confuse, the Julian day commences at noon. Byte that and work it into your DP system. How about starting with 4004 B.C., which Bishop Ussher claimed was the date of the creation (not to overlook William Jennings Bryan).
Further, somewhere between 4 B.C. and

B.C. is as close as modern research has been able to come in attempting to fix the date of Jesus' birth, and 4 B.C. is the

year most commonly given.

The fellow we have to thank for that was Dionysius Exeguus (c. 500-560), a monk or abbot who wrongly dated the birth of Christ on Dec. 25, 753 according to the Roman system (that is, 753 years after the founding of Rome).

John T. Tuthill

Dallas, Texas

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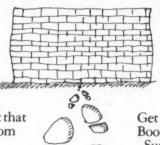
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Packages, Services Accepted

Maturity of Users, Vendors Set Tone Throughout Year

Some years are clearly rememby major events that create waves; others are more like millponds – one knows there's movement, but it's hard to see anything there until the water goes over the falls and does something useful.

"functional stabilization" of DOS/360 several years ago created waves felt by both software vendors and users, but 1976 was a millpond.

There were lots of products introduced in 1976 and many, both old and new, were acquired

and installed in user sites of all sorts and descriptions, often with good results. But there seemed no obviously significant trends or breakthroughs in the items brought to market.

The use of packages became an accepted way of life in many installations. More than mere acceptance, however, there was a sense of maturity displayed by many users and a good number of vendors.

Both sides of what quite naturally might be an adversary rela-tionship seemed to recognize they would accomplish more by working together. User groups

appeared to gain influence with their vendors and few if any horror stories were heard about packages that didn't work and vendors that didn't care

The maturity developing in the software package arena was matched by the users and vendors of remote computing services. Splashy new capabilities were the exception; solid work ices. to use existing facilities - especially in the data base management area - was the rule.

Interest in data base manage ment systems (DBMS) and their extensions was among package users. So was

user concern about on-line systems and teleprocessing moni-

But that seemed mostly for the bigger installations: less than 5%

A Look

of all installations are actively using DBMS now, according to reliable industry estimates.

More widespread - and rather more blurred in the way it was pursued – was an interest in making DP installations more productive.

DP operations have always been both costly and mysterious in the eyes of corporate management. Cost justifications and potential benefit analyses were required for more and more major projects in 1976, whether they involved hardware changes or software developments.

Beyond that, a number of products were introduced in 1976, each with the design goal of getting the non-DP user directly involved in the work.

Perhaps nowhere was that goal

more emphasized than in IBM's Virtual Storage Personal Computing (VSPC) system which was 'introduced" very early in the year. Designed to make the 370 "more approachable" by non-DPers, VSPC apparently did this by putting another layer of software between the user and the machine, in addition to operating systems, language processors and file access routines

Thus, while it eased the way of the novice, this particular product apparently added considerable overhead to the basic DP operation and, in effect, flaunted the professionals' desires to have more efficiency.

Interest in sticking with known equipment (in one case) and known software (in another) led to two separate products for IBM-based installations. In March, Software Design, Inc. offered a package that allowed un-modified IBM DOS/VS and compatible applications to run 360 hardware, a situation that might well mean longer life for that equipment, first introduced in the mid-1960s.

In May, Software Products, Inc. of Mill Valley, Calif., introduced DOS/MVT which support-(Continued on Page 20)

DEC Develops APL Compiler, Terminal Compatible With Entire PDP-11 Line

MAYNARD. Mass. - Digital Equipment Corp. has developed APL-11 — a compiler for use across the company's entire range of PDP-11 minicomputers - and a modified version of a standard terminal to work with the peculiarities of the language's notation.

APL is an interactive language designed to provide users with quick solutions to mathematical problems of moderate plexity, DEC said.

The language is built around a set of unique symbols, each of which represents a desired operation. The symbols and the terms on which they operate may be combined to create extremely detailed and yet concise code,

according to a spokesman.

As developed by DEC, APL-11 apparently includes support for all of the generally accepted operators. The "workspace" available to users of the first release 29K bytes; this will "undoubtbe increased in later releases, the spokesman said.

Although APL has been implemented on a growing number of different CPUs, DEC claimed the introduction of APL-11 marks the first time it has been available across any entire "family" of minicomputers.

Compatibility of the soft-ware – and of user source - extends from the floppy disk-based PDP-11/3V03 LSI configuration to the top-of-theline PDP-11/70 system and includes both RT-11 and RSTS/E environments, the company said.

Variation on Printer

Concurrent with its announcement of APL-11, DEC also intro-duced a variation on its "standard" LA36 printer terminal to work with the new language.

The LA37 has a keyboard that permits entry of APL symbols as well as alphanumeric data; it also has a dot matrix printhead for hard-copy output.

The terminal comes in two versions, supporting either the EIA connection or the normal tele-typewriter loop, DEC said.

While the LA37 was tailored specifically to APL, users with LA36s can have them adapted to the additional language through an option first announced a year ago [CW. Jan. 5].

Beyond that, any APL terminal

with the appropriate hardware interfaces could be used as an device for APL-11, the spokesman added.

The LA37 costs \$3,330. The APL-11 compiler, which will be ready for delivery late next spring, will carry a license fee of \$1,650, the company said from Maynard, Mass. 01754.

IDMS Gains On-Line Query Capability

WELLESLEY, Mass. - Cullinane Corp. has added a separately priced on-line Query option related to its Integrated Data Base Management System (IDMS).

Query handles the interface between IDMS and "most of the currently popular" teleprocessing monitors, Cullinane said.

Described as a management-

oriented inquiry/response facility, Query permits real-time retrieval of key-indicator informa-tion from IDMS data bases. Key indicators include any data that is vital to a user's daily business decision making, a spokesman explained.

The on-line display of key indi-

cators and more elaborate operations are supported by Query's 'English-like' command guage; the system is capable of working with a spectrum of file access methods, the spokesman While the simple command lan-

guage was developed to aid non-DP managers and clerical personnel, it has also been recognized as a very effective tool for data base administrators and programmers in tracking records and setting relationships through the data base, Cullinane claimed.

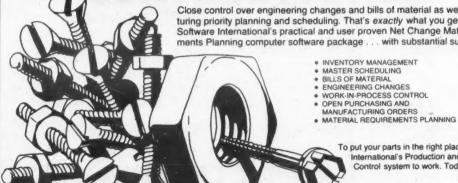
The package also provides record editing according to specifications already stored in the data base. On the "output" side,

it is said to support an average response time of "approximately three seconds.

Ouery is available for Cullinane's Shadow II and for IBM's Customer Information Control System (CICS) and Time Sharing Option (TSO) environments. Interfaces to other major teleprocessing monitors, including Turnkey Systems, Inc.'s Task/Master and Informatics, Inc.'s Intercomm, are currently under development, Cullinane said.

Release 1 of the Query option is available to IDMS users for \$9,000, the vendor added from the Wellesley Office Park at 20 William St., Wellesley, Mass.

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Digest of Federal Programs

FSEC Publishing First Catalog

WASHINGTON, D.C. - The first issue of the "Federal Software Exchange Catalog" will be available in late January and updates are expected every three months after that, according to Franklin W. Leibsly, who runs the Federal Software Exchange Center (FSEC).

The center was organized earlier this year [CW, July 19] to encourage sharing of programs by government agencies. A joint venture of the General Services Administration and the National Technical Information Service. FSEC is meant to be self-sustaining but not profit-making Leib-

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The catalog will contain abstracts of programs reported to FSEC by participating agencies under a plan outlined in February by a Federal Property Management Requirement. Users in federal, state and local government units can purchase copies of whatever listed programs they need through the center.

Charges made by FSEC for the programs will vary depending on their size and complexity but will be minimal compared with the cost of developing the soft-ware all over again, Leibsly said.

Organization of the catalog may change during its arst year; the optimum indexing scheme is still not clear. The publication might be laid out by application areas, programming languages, operating systems or machine environments or a combination of these keys, he pointed out.

The rules under which FSEC was organized prevent any of the programs in the exchange being considered in the public domain Therefore, nongovernment users cannot participate in the program, Leibsly noted.

But once the system is fully operational, federal agencies will have to participate. They will be required to certify that they have searched the catalog unsuccessfully before they can be granted authorization to seek

software from outside sources. The 1977 catalog, including updates, will cost \$75; requests must be accompanied by a complete mailing address and a properly authorized purchase order or check payable to the General Services Administration, Leibsly said from the FSEC, 5285 Port Royal Road, Springfield, Va.

Maturity of User, Vendor Set Tone for Whole Year

(Continued from Page 19) ed DOS operations on either 360 or 370 gear. Conceptually similar to other DOS enhancements, this one claimed the ability to support 12 concurrent tasks, a marked improvement over the three partitions backed by IBM's DOS/360 or the six supported by The Computer Software Co.'s

Extended DOS (Edos).

Languages' Role Large

Languages played a large part in the product announcements and software-related news in 1976. Data General, for example, introduced a Cobol said to be compatible with the 1974 standard for use on its Eclipse commercial systems. Sycor offered Cobol for its 440 terminal system, while Datapoint implemented its version of the language on the 5500 later in the

For its part, the American National Standards Institute (Ansi) introduced draft standards of Basic and Fortran in the spring and approved the PL/I draft that been out for review since

1975 in the summer.
Following an unconventional but completely legitimate route, the users of Mumps put a draft standard of that language out for consideration; all indications pointed to its ultimate acceptance as a standard under Ansi's sanction.

Meanwhile the Federal Government moved to bring its Cobol Compiler Validation Service up to the 1974 specifications and to implement a similar audit system for Fortran processors.

At year-end the Fortran testing routines were said to be available from the National Technical Information Service.

In a move that probably couldn't be matched by any other group of users but must have given some hope to taxpayers, the government also created the Federal Software Exchange Center to encourage the sharing of existing programs by federal agencies.

A 'Star' Is Born

ROCKVILLE, Md. - Businesses that must respond quickly to a large and constantly shifting volume of demands from customers can manage complex workforce systems with the Scheduling Time and Resources (Star) service now available on the General Electric (GE) remote computing network, according to a spokesman.

Star helps high-volume, customer-oriented service businesses forecast, schedule and assign personnel so there are enough employees working in the right places at the right times, without overstaffing, GE said.

The system can manage a workforce of up to 1,000 employees at any one business location, the vendor added.

Star uses statistical techniques to forecast the number of positions needed to handle anticipated workloads and to schedule individual workers. It also maintains records of the assignments and prepares management reports of how the scheduling was handled, the spokesman said

Customized for Each User

Star is tailored to each user to take into account a business's legal and contractual agreements affecting such areas as length

of employees' workdays and length of work breaks, he said.

Star consists of five modules – forecasting, scheduling, allocating, assigning and administering – which can be used independently or as an integrated system, he said.

Mark III service on which Star is based is available foll-free in more than 500 metropolitan areas in 20 countries, GE noted from network headquarters, 401 N. Washington, Rockville,

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Easing Return to Society

On-Line DBMS Monitors Drug Addicts' Rehabilitation

NEW YORK – The Vera Institute of Justice has successfully implemented a large-scale program to rehabilitate drug addicts and ex-convicts – by putting them to work in carefully controlled situations, according to Dr. Norman J. Jacknis of the institute.

The program is complex enough so that an on-line data base management system (DBMS) was needed to keep it moving, Jacknis said.

Administered by the Wildcat Service Corp. (which was created by Vera), the program started in 1972 and has since helped some 4,000 ex-addicts regain useful and productive lives, Jacknis stated.

The key to Wildcat's success is in providing subsidized jobs that initially impose low stress levels on the participants, he noted.

Economic productivity of the projects assigned to the workers is gradually increased, resulting in a smooth transition from subsidized to completely nonsubsidized jobs during the period of their enrollment (they "graduate" from the program in 18 months or less), Jacknis explained.

explained.

At the same time, job-related stress is gradually increased until real-life environments are simulated, he stated.

Most of Wildcat's expenses, including salaries paid to the participants, are derived from welfare checks turned over by the participants, manpower training grants and revenues resulting from the work projects, he added.

DBMS Angle

Where does DBMS fit in? When there are 1,400 participants concurrently enrolled in the program, 300 simultaneously active projects to which they are assigned and an overall \$18 million budget to administer, there is a lot of data to manage, Jacknis contended.

Add to the already substantial information processing workload the necessity to carefully match individual participants to

available jobs, he said.

Then consider the dynamic nature of the program and the need for tighter controls to facilitate growth of the program, and to enable even larger-scale national rehabilitation programs to be modeled after Wildcat.

The result: exit of the existing remote

The result: exit of the existing remote job entry/batch system, entrance of the interactive DBMS, he added.

Vera's data management needs were solved through the facilities of the Rapidata, Inc. remote computing network, including DBMS-10 software, according to Jacknis.

Personnel and project status systems form the nucleus of the data base. Typical personnel data, similar to that found in a commercial environment, is kept for each participant in this simulated real-world program.

Time sheets for each participant are generated weekly based on projects assigned for the following week; completed sheets are later processed to generate performance/attendance histories and to provide input to the payroll system, he explained.

Keeps Track of All Records

The data base keeps track of all projects, including current status, cost data and a historical trail of participants assigned to each project. Contract information and a general ledger system are also built into the model.

Plans for expansion include adding inventory and supplies requisition modules to the data base.

Historical records of personnel status changes (promotions, demotions, changes in skill or adjustment levels) are typically accessed for specific individuals; but changes that relate to a given project or

class of projects can be quickly assimilated to examine the rehabilitative effects of certain kinds of projects, Jacknis stated.

Database flexibility was of utmost im-

Data Basics

portance as new data and new uses for the data will be added to the system as the program develops, he explained.

Rapidata's X2C data management language was a prime factor in how fast the system became operational, Jacknis stated

"In one and one half weeks of part-time effort, several complex reporting and analysis programs were written that ordinarily would have taken a year to develop and debug – and this included learning X2C from scratch," he said.

Database updating as well as reporting functions are programmed in X2C.

The ability of DBMS-10 to represent

The ability of DBMS-10 to represent naturally occurring data relations within the database network has eliminated duplication of data, resulting in a high degree of system integrity, Jacknis indicated.

Integration of various kinds of data previously stored in separate, unrelated files resulted in yet another unanticipated bonus; it enforces a much tighter operational discipline among Wildcat employees involved in administering the program, he explained.

gram, he explained.

An added benefit of the centralized on-line data base is the increase in effec-

tive communication between groups, according to Jacknis.

For example, promotion or demotion information logged into the data base is instantly available for use by the disbursements group. Newly procured projects are immediately made known to the project assignment and scheduling groups.

In turn, project planning and inventory/supply groups are alerted to the new requirements, he added.

Not all data must be updated in realtime, however, and the system has been designed to take advantage of the network's off-peak rates for many routine updating and report runs. Jacknis said.

updating and report runs, Jacknis said.

Processing of these jobs is automatically started by the time-sharing monitor at a predetermined time each evening or on a given night of the week.

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Training Goes to DPers, Users As California Unit Adopts A/V

SACRAMENTO, Calif. - Training should be scheduled for the employee not the other way around; and, whenever possible, training must be directly related to a current work assignment, according to William B. Coleman, developer of Sacramento County's systems and data processing training.

Sacramento's objective required in-

house programs, immediately available to any employee or group, Coleman indicated. "Our analysis led to the audio/visual (A/V) approach," he said.
"Traditional classroom methods are too

inflexible to meet our need. Our availability requirement would put the cost of classroom instructors out-of-sight. Packaged training, self-study video tape and film products were the only way for us to go," he explained.

We're meeting the objective," Coleman said. "When Sacramento employees need to learn or refresh a given subject, they call the training center for a self-study

The Human Connection

module which they get within 24 hours." Organized group programs can also be arranged and this improves the effectiveness of A/V training, according to Cole-

Line managers often conduct group programs to bring up specific skills. They identify self-study modules for their people to learn in the training center and enhance these with group discussions and

practice problems, he continued.

Sacramento is a medium-sized county with a population of 700,000. Of the 6,500 county employees, about 130 are in central DP, but the county is taking a big approach to training, according to

"One way or the other the cost is there. You can pay people to do the job two or three times or you can teach them to do it right the first time.

First Big Step

The first big step was a 1974 purchase of 150 tape modules offered by Edutronics, Inc., Coleman said. Considered a "basic technical package," it starts with elementary DP ideas and vocabulary and progresses through data base, communications and control concents, he explained

tions and control concepts, he explained.
"The initial 'package' was sound and
we've added most of the newer modules. It's not a complete answer for our technical people, but our supervisors can fill in the gaps," he said.

"We also use about 50 of the modules our Customer Training Program, which gives our users a basic understanding of DP. We average over 300 planned student modules per month and about half of these are user training," he noted.

The training center has six Fairchild 70-07 film cartridge projectors and a Sony reel-to-reel unit in seven individual study carrels.

Their use is scheduled and administered by a training librarian who calls on-line people to help trainees with the oc-casional technical questions. The librarian also administers and grades retention tests, Coleman stated.

Sacramento uses self-tests during each module so trainees can tell how much they've learned. The rule is, repeat the training material until you have it 100%, he added.

A retention test, administered by the librarian, is scheduled at least a week after each study module. A retention score under 90%, which is rare, requires a

Multivendor Approach

Believing in a multivendor approach, Sacramento recently added an A/V package from Advanced Systems Inc. (ASI), according to Coleman. Concentrating on administrative management skills, it will help develop the user/DP involvement that is vital in reworking operational systems and building new ones, he pre-

"The money you spend is important," he said, adding "the place to measure training cost is at the point of use. Our training center cost is under \$2 per student module."

We measure benefits there too - 90% retention. The line managers measure effect on production and it must be good; they keep sending people back for more," he continued.

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Increased Flexibility Marks '76 as Year of the User

By Ronald A. Frank

Of the CW Staff

Teleprocessing users gained more equipment flexibility during 1976 as independent terminal suppliers improved on IBM CRT capabilities.

At the same time, IBM "throttled back" somewhat on its Synchronous Data Link Control (SDLC) by providing Binary Synchronous compatibility for previously SDLC-only devices.

And 1976 saw the independents phase into the System Network Architecture mode. In June, Sanders demonstrated an SDLC interface for its 3270-type CRTs and other vendors said they were ready to follow as soon as IBM released enough technical details on the network architec-

Despite the promises, relatively few

sers were operating SDLC in-house nets. And as users were evaluating the merits of distributed DP, the costs of such nets kept rising.

IBM increased maintenance prices late in the year for its most popular CRT and teleprinter devices while introducing the Advanced Communications Function (ACF) for SNA networks. ACF promised truly multiple mainframe networks, but the necessary software was still months

In the service area, Telenet increased its packet-switched services and the Canadian Datapac net was demonstrated in an international hookup across the Atlantic. packet-switched standards area seemed to be moving toward universal

adoption of the X.25 protocol.

But the amount of full-duplex traffic

limited. Most of the packet users were operating on asynchronous lower speeds while modem suppliers made 9,600 bit/ sec transmissions more reliable on private-line nets with the introduction of

Look Back

network processors that stressed line monitoring and error-checking features. AT&T phased into the applicationsoriented service area with its Transaction Network Service which utilized its ESS central office as a switching device for credit authorizations and related financial

The AT&T Dataspeed 40/4 was tariffed in 40 state jurisdictions by year-end and the Federal Communications Commission (FCC) apparently gave the go-ahead for an interstate tariff as well. There was no doubt the phone company was becoming more aggressive as it followed the lead of Vadic and Universal Data Systems with the introduction of a full-duplex 1,200 bit/sec, two-wire data set.

Bell also went into the "portable terarea by unveiling the 43 Teleprinter which used the plug-and-jack arrangement tentatively approved by the FCC. Few devices were operating under this system without Data Access Arrangements because of legal tangles and unclear regulations.

Network experts saw the Bell Transaction Network Service as the forerunner of a general-purpose, packet-switched offering by Bell. And there were indications that AT&T was set to announce such a service soon. Although AT&T had told some international experts the service would be X.25-compatible, it was clear the options rested with Bell.

As teleprocessing equipment costs went up, the trade-off between minicomputerbased networks vs. more conventional central "site mainframe-based configurations became more important but less clear.

Some users like Citibank tied together the new IBM System/1, but it was still an immense undertaking to disperse a large. more conventional private-line network.

As 1977 dawned, the regulatory arena made it very difficult for users to plan network upgrades several years in the future and many of these issues were being argued in Washington with very limited user input.

Upgrades PACX Speed, Control Gandalf

WHEELING, Ill. - Gandalf Data, Inc. has introduced upgraded versions of its Private Automatic Computer Exchange (PACX) systems offering higher transmission-handling capabilities and additional monitoring and control features.

PACX systems allow users to connect a

larger number of terminals to a given number of PACX ports, according to a Gandalf spokesman.

Each PACX system is composed of five function blocks including the terminal logic and port logic, which both interface the system's control circuitry and multi-

The control circuitry is accessed by the control panel, which reportedly enables the operator to communicate with PACX for control and monitor functions.

The PACX power supply provides power for normal system operation and also auxiliary power – for PACX I and II systems - to preserve memory contents in the case of a power failure, the spokes-

The upgraded PACX II and Mini-PACX systems include a control port for the additional monitoring and control functions, the spokesman said.

Four Versions Available

Four versions of PACX systems are available - PACX I and II and Mini-PACX I and II. Each version is modular and can be expanded from the minimum of four terminal connections and eight ports in multiples of four and eight respectively.

PACX I and II systems handle a maximum of 254 terminals through a maximum of 126 input ports. Mini-PACX systems can handle up to 48 terminals through up to 32 port connections, according to the company.

Four different terminal connections are possible with any PACX version: through short-haul modems equipped with class determination switches; through the dial network and conventional modems; by dedicated lines and conventional dems; and by direct connections through EIA interfaces.

Choice of Service Class

The choice of service class on fullduplex, dedicated lines can be determined the terminal user with a Gandalf Thumbwheel Dial Unit or similar device, he said.

Synchronous or asynchronous operation is possible with dial-up or dedicated lines. PACX I and Mini-PACX I are capable of asynchronous operation at 4,800 bit/sec and synchronous operation at 9,600 bit/ sec; the PACX II and Mini-PACX II upgrades operate at 9,600 bit/sec and 19.2 kbit/sec respectively, according to the firm.

In addition, the upgraded versions can monitor requested connections and disconnections by means of a remote computer port, Gandalf said. They also inthe control port facility enabling version II operators to change port classes force connections under CPU control, the spokesman noted.

PACX systems accommodate terminal users on a first-come, first-served basis in normal operation, he said.

On the computer port side of the PACX devices, connections can be made directly to the CPU from any PACX port board or through data links using limited-distance data sets, multiplexer links or long-haul modems, he added.

PACX I and II systems were specifically designed for installations with a large number of various types of remote terminals accessing a smaller number of computer ports, such as university or research environments, he said.

The basic price for a Mini-PACX II is \$4,000; the PACX II hardware costs \$7,500. A "typical" system would be a 72-terminal network with equal groups communicating directly to PACX II through short-haul modems and another group transmitting over dedicated lines through long-haul modems, the spokesman explained.

This terminal network contending for PACX II ports would cost \$17,100, he said, noting prices for Gandalf equipment were used in the price calculation.

Gandalf is located at 190 Shepard Ave., Wheeling, Ill. 60090

Telenet Adds In -Wats Service

WASHINGTON, D.C. - Telenet Communications Corp. has instituted nationwide in-Wats service for access to its packet-switched public network for computer and terminal communications.

The "800"-number Wats service supplements local network dial-in numbers available in the U.S. and Canada, according to a Telenet spokeswoman.

The connection charge for use of the Wats number is \$14/hour, which Telenet estimated as 20% to 30% less than the cost of the average long-distance call de-pending on the business area called from and the time of day, she said.

The network port charges are included in this figure, the spokeswoman noted.

An optional caller identification service

has been provided to allow the carrier to screen incoming calls for customers.

Telenet is located at 1050 17th St. N.W., Washington, D.C. 20036.

Focis Promoting Fibers

VERNON, Conn. - A society has been formed to promote the use of fiber optics for data communications.

The Fiber Optic Communication Information Society (Focis) includes representatives of both manufacturers and users of fiber optic cables, connectors, devices and systems, according to a spokesman.
Focis was formed to aid the transition

from the prototype phase to widespread usage and mass production, which is expected in the next two years, he added. Membership in Focis is \$20/year. The

society can be reached at P.O. Box 2264, Vernon, Conn. 06066.



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MDB Has Multiplexer for Novas

ORANGE, Calif. – The MDB Systems, Inc. Model 8063 multiplexer for Data General (DG) Nova computers provides an interface for four or eight asynchronous data sets or local terminals with an RS-232C interface.

All data transfers are under program control of the MDB multiplexer, with each of the transmit/receive channels treated as a separate device with a common device code address, the company said.

Additional multiplexer interfaces can be added to build a system with a maximum of 64 channels having the same device address a spokesman noted.

address, a spokesman noted.

The features of the 8063 allow the user to build a communications system requiring only one slot in the Nova chassis.

cations system requiring only one slot in the Nova chassis. The price for a four-channel Model 8063 is \$1,250; the eight-channel version costs \$2,250 from MDB at 1995 N. Batavia St., Orange, Calif. 92665.

Employers' Recruitment Strong

'76 Communications Salary Levels Up

NEW YORK — Communications industry employers began recruitment in record numbers in 1976 and salary levels generally increased throughout the industry, according to Personnel Resources International, Inc.'s annual telecommunications salary survey.

The industry has exhibited a strong recovery from last year's recession hiring picture, the New York-based firm specializing in telecommunications career

placement noted.

There were fewer layoffs this year than in the past two years and those who did lose jobs, such as Data Transmission Corp. (Datran) employees, usually found new ones quickly, Personnel Resources said.

Employees who had jobhunting difficulties were at the \$23,000-and-up salary level or had not kept up with the technical state of the art, it added.

Independent telephone com-

panies had increased personnel demands for all types of engineers with data communications backgrounds, the placement firm noted.

In addition, the survey indicated, the satellite and specialized common carriers continued to be a good source of employment for industry personnel.

Bell Raises High

In compiling the survey, Personnel Resources found that Bell "and a few other companies" have continued to grant salary increases to various levels of employees out of line with general industry averages, "which would make them untouchable by other employers."

This was striking because "most of these employees are working in a noncompetitive environment," the placement firm said.

Salaries for message-switching programmers kept up with inflation, rising about \$1,000 from 1975 levels to between \$14,200 and \$17,200. Senior telecommunications programmers earned between \$16,200 and \$20,100, also an increase of about \$1,000 from 1975, survey results indicated.

Communications managers experienced heavy salary increases of about \$4,000, rising to between \$23,100 and \$30,600, according to the survey.

cording to the survey.

Analysts with some data communications experience earned \$16,400 to \$20,900, representing increases of \$1,400 to \$1,900 over 1975 levels. Communications and consulting directors earned \$21,200 to \$28,700

\$28,700.
Salaries in the New York City area were \$500 to \$3,500 higher than national salary averages in those categories, according to survey figures.

Personnel Resources said the

Personnel Resources said the survey represented the "mid-50% of data" taken from recent applications and placements made by the firm. It added some extrapolations and estimates were made to complete the survey.

Free copies of the survey are available from the firm at Suite 1234, 342 Madison Ave., New York, N.Y. 10017.

DEC Reduces Service Costs

MAYNARD, Mass. — Digital Equipment Corp. has reduced the service costs for its 110- to 300 bit/sec Decwriter II dot matrix terminal from \$25/mo to \$19/mo.

The 24% service rate reduction is effective in January and applies both to current and future users, according to the firm in Maynard, Mass. 01754.

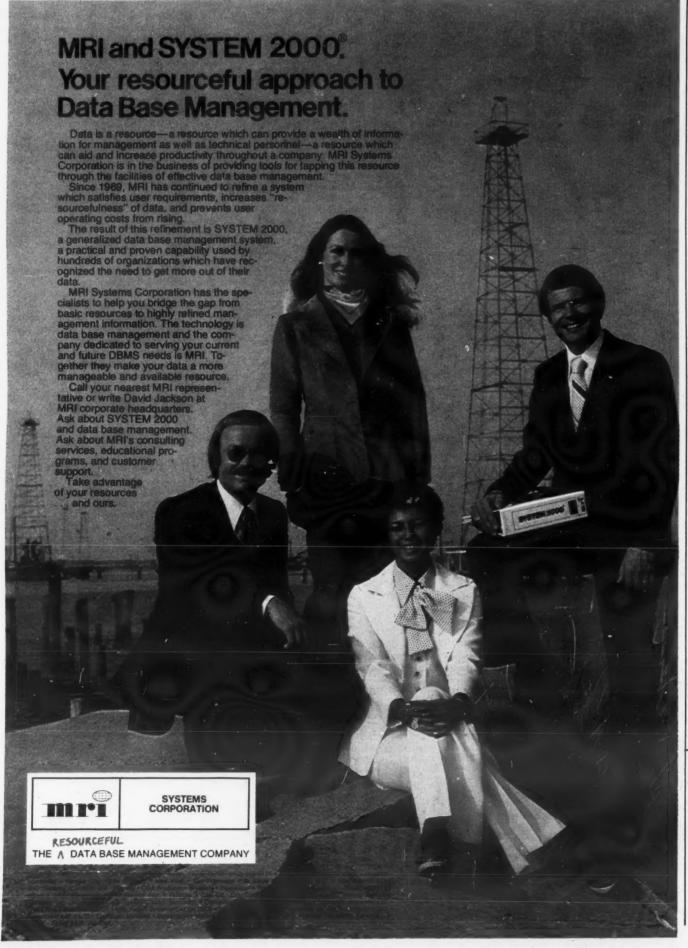
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Unitech Cluster Offers Modularity for Distributed DP

AUSTIN, Texas - Unitech, Inc. has taken a modular approach to distributed DP with its microprocessor-based keyboard-to-diskette terminal system.

The Data Entry Station Cluster (Desc) is a network component which performs as a stand-alone device communicating with an IBM host site for data entry and distributed data base management, according to a Unitech spokesman.

The cluster can also be linked with Unitech UT-1 or UT-2 remote batch terminals to communicate with IBM, Control Data Corp., Univac or Honeywell host sites and can be configured to meet special user requirements, he said.

Each Desc can contain one to four CRT/keyboard operator terminals, one to four IBM-compatible disk drives and a cluster controller with a Motorola M5800 microprocessor handling up to four Descs.

M5800 merop...
up to four Descs.
The diskette drives can be placed at each individual workstation or in a master drive cabinet. Stations can be located up to 10 feet apart from each other and up to 500 feet from the Desc controller, although greater separations can be achieved with asynchronous modems, the company said.

Desc operating software is available for binary synchronous communications in IBM 2780 emulation mode via RS-232C-

Cummins Remote CRT Works With Keyscan

GLENVIEW, Ill. – Cummins-Allison Corp. has a remote CRT terminal designed for operation with its 5400 Keyscan system.

The 5400 Keyscan addresses the Model 5441 remote terminal as if it were installed at the host site through dial-up, half- or fullduplex lines, Cummins said.

With the 5441, remote keystation operators can enter, verify, correct and update data and transmit the data to the 5400 for processing, according to the firm.

The terminal has an integral modem and an intelligent host processor terminal controller which reportedly allows installation of the 5441 without operating system software changes.

Each intelligent controller can support up to four remote stations; a total of 32 remote or local keystations can be supported by the Keyscan system, a Cummins spokesman noted.

Purchase price of the 5441 remote terminal is \$3,735; it can be leased for \$95/mo on a two-year contract including maintenance; Cummins said from 800 Waukegan Road, Glenview, Ill. 60025.

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THE INCREDIBLE SYSTEMS & T-SHIRT COMPANY Box 2623 Menio Park, CA 94025 compatible modems at transmission rates up to 9,600 bit/sec.

It is also available for cluster networks where Desc is joined with a Unitech remote batch terminal communicating to IBM, CDC, Univac or Honeywell CPUs.

Asynchronous communications with external systems through an RS-232 interface are also possible, the Unitech spokesman noted.

In addition to remote communications facilities for full- or half-duplex standard data links, Desc reportedly has the capability for advanced data link control procedures such as IBM's Synchronous Data Link Control Terminal screen capacities are 25 lines of 80 characters each and the diskette capacities range from 151K-byte, 80-character

Terminal Transactions

(SDLC).

Since the cluster is programmable, the spokesman said, it can accommodate future protocol and code requirements without severe equipment modification. records to 242K-byte, 128-character records, the spokesman said.

Each cluster can be supplied with print capabilities from an optional 80- to 200 line/min printer, he noted.

Up to 32 workstations are possible in Desc configurations grouped around a UT-2 or up to 16 when grouped with a UT-1.

The basic Desc consists of one GRT/keyboard terminal, one diskette drive and the cluster controller and costs \$6,600. Each additional CRT terminal costs \$2,600 and additional disk drives are priced at \$1,000 each.

The optional printer for each four-station cluster costs \$5,500. Unitech is located at 1005 East St.-Elmo Road, Austin, Texas 78745.



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General Instrument Makes Additions To Its 400 Series of POS Data Systems

NEW YORK - General Instrument Corp. (GIC) has intro-duced two additions to its Unitote/Regitel electronic point-of-sale (POS) 400 series data sys-

The computer-controlled 420A and the intelligent 425 terminals are said to be interactive and programmable to provide retail users with tailored capabilities.
The 420A is controlled by dual

in-store minicomputers and fea-

tures a 16-character alphanumeric display combined with a prompter display to lead the operator through each transaction, the company said.

event on-line communications with the single store-level communications controller (SLCC) are disrupted or if the SLCC is down, according to a spokes-

Terminal Transactions

The stand-alone Model 425 is capable of controlling transaction sequences off-line in the

Both terminals have 23-key in teractive keyboards etched with operating instructions tailored to each store's needs reportedly allowing salespeople to select automatically sequenced transactions.

The salesperson's display on the 425 provides the last five digits of data entered into the system, the spokesman noted.

Both 400 series terminals feature multistation dot matrix printers which handle up to 40 characters of alphanumeric information on each line.

The journal/receipt station is designed to use single or twopart paper and provides an audit trail on the journal roll as well as a customér receipt if the twopart paper is used, the spokesman stated.
The Model 420A costs \$3,120

and the intelligent Model 425 is priced at \$3,650.

GIC is at 100 West Road, Tow-son, Md. 21204.

Image Magnifier Interfaces CRTs

VERONA, N.J. - The Image Magna I from Image Magnification, Inc. (IMI) is designed to interface televisions and CRT computer terminals to display a large high-resolution black-andwhite picture.

Reportedly capable of direct display of computer-generated characters, it can be interfaced with most raster scan CRT terminals and will display as many as 24 lines of 80-character density per line, according to a spokesman.

The Image Magna I produces images of from 3 by 4 feet up to 15 by 20 feet with a picture throw ratio of two times the

screen width, he indicated.

IMI's Image CRT display magnification device is priced at \$4,200 from the firm at 538 Bloomfield Ave., Verona, N.J.

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Amdahl Installations, Itel Introductions

Year Highlighted by IBM Plug-Compatible CPUs

Of the CW Staff

It was the year of the IBM plug-compatible CPU as 1976 saw the first deliveries of Amdahl Corp.'s 470V/6 replacing IBM 370/168s and the introduction of the Itel AS/4 and AS/5 as replacements for the 370/158.

The overwhelming user acceptance of the Amdahl unit was particularly impressive and boosted the prospects for the entire field.

But other potential entrants into the plug-compatible CPU area are still watching the experiments before jumping into

the field - especially Control Data Corp., which may market a 370/145 replacement, and Hitachi, which is eyeing the 370/135 market.

And IBM pricing moves - plus the introduction of the 370/138 and the 370/148 – may make the future for these competitors more hazy.

In 1976, however, there were few problems in the area; the first users of the Amdahl machine all reported complete IBM compatibility, increased throughput and major savings over comparable IBM

For example, the Southwestern Ohio

Regional Computer Center estimated savings of \$700,000 over the next five years from using the Amdahl system instead of an IBM 370/168. In addition, by tying

A Look Back

independent peripherals into the system, center will \$200,000

At Massachusetts Mutual Life Insurance Co., savings were predicted at over \$1 company said "the compatibility is real" between the Amdahl system and the previous IBM units.

At the University of Michigan, a 2M-byte 470 was reported performing various batch and on-line jobs 30% to faster than a 2M-byte 370/168.

And so it went from the first users of the Amdahl systems - all reporting increased speed and reduced costs.

This success story was one of the reasons Itel jumped into the field, marketing the AS/4 and AS/5 that range in power from 1.4 times that of the 370/148 to the equivalent of a 370/158-3MP system, according to Itel.

But the Itel systems won't get their real tests until 1977, when the first users get their hands on the systems and really test them in an operational mode.

What others do in the field of plug-compatible CPUs will also have to wait for 1977, if the IBM announcements of the 370/138 and 370/148 have not already foreclosed the field.

For the first time in history, IBM offered increased power at reduced costs, which may make it difficult for others to enter the replacement market for those ma-

The two systems on the drawing boards - A CDC offering in the 145 and 148 area and a Hitachi product in the 135 and 138 class of size – could have easily offered price/performance breaks for 135 and 145 users, but with the reductions offered by IBM with the 138 and 148 such savings may be harder to come by.

By E. Drake Lundell Jr.

Of the CW Staff

Compared with the activity in the plugcompatible CPU area during 1976, activity in the medium and large-scale systems and peripherals field may have seemed rather slow.

But a second look indicates this was not the case – IBM alone announced new products at an unprecedented rate of one per month, price cutting put the whole field in an uproar and innovation continued at a rapid rate.

The entire field seemed slow except for the plug-compatible CPU area because no major revolutionary systems were announced. The products that actually reached end users were upgrades and evolutionary in nature.

In addition, users and industry alike expected 1976 to be the year for IBM to announce a new range of computer systems to replace the 370 line. That hope was not fulfilled.

The major activity in the systems area came with the price cutting of memory resulting from cheaper production costs for the semiconductor memory systems used in most large computers.

But all the major mainframe suppliers were active during the year in the big systems area.

announced the 370/138 and the 370/148 - the first systems in the history of IBM to offer increased performance over their predecessors at a reduced cost. Usually the increased performance also called for a price increase

Furthermore, the firm announced the 370/168 Attached Support Processor (ASP) and the 370/158 ASP which provided 1.3 to 1.8 times the internal speeds of the "plain vanilla" 158s and 168s. In other action, IBM offered a host of specialized terminals and peripherals, increased the memory capacity on the 370/115 and 370/125 and delivered the

first 3850 systems.

Control Data Corp. remained active in the IBM plug-compatible peripherals area – along with many of the other independent peripherals suppliers which of-fered new memory, disk and tape options

to IBM users.

But CDC also brought out a new sys tem - the Cyber 70 Model 71, which it described as an "entry-level large-scale system." This announcement showed CDC is still active in the systems market even though its major attention has apparently shifted to peripherals and serv-

Univac was also active in the systems field - but once again with upgrades and enhancements rather than anything star-

The firm introduced the Univac 90/80 at the National Computer Conference. It was the first Univac system to use emit-ter-coupled logic and was aimed at IBM 370/145 users or potential users.

Burroughs enhanced many of its systems during the year by introducing the B6800 with two times the power of the B6700 and an enhanced B7700 said to offer 35% greater performance than its predecessor, for example.

addition, the firm introduced the B1800 system that is in the price and performance range of the IBM 370/115.

NCR made a major upgrade, replacing the Century series of computers with the first models of the Criterion series. The first two models – and the only ones announced so far – were the 8550 and 8570, said to offer 35% more power than the IBM 370/115 and 370/135 respectively. They were designed to fit into transaction-processing systems, which is NCR's major thrust in the systems area. Honeywell, which was embroiled in cona big splash in the minicomputer area, announced an enhancement to its 60/66 machines and continued to push the 60

Digital Equipment Corp. was particularly active not only in its main base of minicomputers, but also in the mediumand large-scale systems area.

During the year the firm encroached further into this IBM domain with the Decsystem 1088, a dual-processor version of the 1080; announced the Decsystem 2050, which was said to have twice the power of the previous 2040 and compete in the IBM 370/138 to 370/148 range of machines; and also offered the Decsystem 1090 in the 370/148 to 370/158 range as well as its companion 1099, a dual-processor configuration.

As Minicomputer Use Gains

Federal Users Mainframers Lose Ground With

By Edith Holmes

Of the CW Staff

WASHINGTON, D.C. - The Federal Government moved slightly away from IBM and other large mainframers in 1976 as it increased its use of minicomputers.

While IBM kept its "king of the market" status, several smaller competitors gained ground in share of U.S. government business, the General Services Administration (GSA) found when it completed its latest inventory of federal DP equipment here recently

IBM, Control Data Corp. and Univac lost percentage points in their respective shares of the \$4.414 billion federal market in fiscal 1976, but Digital Equipment Corp., Hewlett-Packard Co. (HP), Varian and Data General Corp. (DG) share improvements over the fiscal 1975 inventory figures.

IBM was the vendor for 27% of the DP

machinery used by the government in fis-1976, but the mainframer had provided 31.1% of that equipment in the previous year, according to the GSA inventory, which included figures from the Department of Defense

The value of federal computers and related devices manufactured by IBM also slipped from \$1.541 billion or a 35.8% share of a total market of about \$4.302 billion in 1975 to \$1.439 billion or a 32.6% share of the 1976 value of governinstallations, the inventory gested.

CDC Univac Shares Slip

CDC and Univac showed similar dollar losses, although both of these firms increased the overall number of "units" including CPUs, storage devices, I/O equipment and terminals they have placed with the government, the inventory said.

In 1976, CDC had \$727 million in equipment with the government, amounting to a 16.5% share of the federal marketplace. At the end of 1975, however. company had \$747 million worth of machinery or a 17.4% piece of the federal

With \$606 million or a 14.1% share in fiscal 1975, Univac slipped to \$582.9 million or 13.2% of the federal dollars tied up in DP equipment in 1976, according to inventories for those years.

Taken together, IBM, CDC and Univac

held 62.3% of the federal market this past fiscal year as opposed to 67.3% at the end of fiscal 1975, the GSA found.

IBM lost position in the number of units of DP equipment it has installed with the Federal Government. The 58,038 IBM units operating there in 1975 dwindled to 55,335 units in 1976

In addition, the GSA inventory noted IBM sustained net losses in sheer numbers of devices for all equipment categories. There were 1,202 CPUs owned and leased from IBM in 1976, for example, indicating the additional 118 mainframes listed in 1975 have been unplugged.

This same trend was true of other IBM equipment: 8,421 storage devices were included in this year's inventory where 846 more were listed last year; 12,311 I/O devices in 1976 were 331 units stronger the year before; 4,965 terminals this year meant a loss of 102 from the previous year's 28,634; devices listed in the "other" category for 1976 were 1,306 less than those listed for 1975, the

In contrast to IBM, both CDC and Univac picked up the number of DP units they placed with the Federal Government during this past fiscal year.

CDC added 1,315 units of various types

to its federal rolls for a 5.5% increase over the 23.809 total it had with the government the year before. Univac increased the number of its units by 1.4% from 20,034 units at the end of fiscal 1975 to 20,305 units.

Despite these gains, however, CDC's of installed units slipped from 12.8% to 12.3% and Univac's share of the federal base dropped from 10.7% to 9.9%, according to the inventory.

Gains for Others

But what were losses for some were gains for others. Hard on the heels of Burroughs, which had a 5.8% share of the units and the value of the equipment installed with the government, DEC went from a total of 7,888 units in fiscal 1975 to 10,392 units, a 31.7% increase.

DEC's unit share of the federal market rose less dramatically, from 4.2% to 5.1%. With \$99 million worth of machinery installed at the end of fiscal 1975, DEC had 2.3% of the federal dollars in DP. This year those figures have gone up to \$122.8 million or 2.8% of the dollar share.

DG experienced a 44.8% increase in units installed in the government, going from 1,332 units in fiscal 1975 to 1,914 units in fiscal 1976. The dollar value and share of the federal installation base increased, too, from \$12.1 million or a .28% share to \$15.5 million or a .35%

HP went from 2,033 units with the government in 1975 to 2,808 units in 1976, a 39.1% increase in units. Its federal market share climbed from 1.1% to 1.4% or from \$20.5 million to \$28 million. HP increased its share of the federal base from .48% to .63%.

Key-to-Disk System Helps Co-Op Improve Productivity

FRIDLEY, Minn. — After replacing conventional card punching with a key-to-disk system, Midland Cooperatives, Inc. here said it is handling twice as many data entry transactions with a net reduction in total processing costs.

total processing costs.

The wholesale supply and manufacturing cooperative, owned by and serving more than 700 retail cooperatives, has annual sales of more than \$280 million and has had a DP department for 21 years.

Operated under the overall direction of manager Jim Krautkremer, the department processes general accounting, inventory control and newspaper circulation management applications on an NCR Corp. Century 201. The department is operated as a service bureau to handle accounting for the retail cooperatives which Midland serves.

Data entry was previously handled on nine conventional Univac keypunches, according to computer operations supervisor Bob Kemp. "If we were handling data entry on card punches today, we'd need another building to house the equipment and personnel," he said.

Extensive Study

To solve the problem, Midland investigated a number of different possibilities, according to Don Masterson, special projects manager. "We primarily looked for data entry equipment with maximum editing capabilities," he explained.

editing capabilities," he explained.
"We have operated on-line data entry
systems since 1966, but decided that



Operation of a key-to-disk system at Midland Cooperatives, Inc. has enabled the co-op to double its transaction volume.

key-to-disk would be superior to on-line data entry in this application because of the greater speed of data collection."

So, after extensive study, Midland installed a Univac 1900 Computer-Assisted Data Entry (Cade) key-to-disk, Masterson said.

At the time the key-to-disk system was installed, Midland was handling about 350,000 data entry transactions. Since then, total transactions have doubled to more than 700,000 a month, he stated.

Yet this doubled transaction volume is being handled with only a small increase in staff and at less cost, he indicated.

"We're now using the key-to-disk data entry systems to process 30,000 to 35,000 transactions or line items a day with one shift of nine data entry operators and a second shift of four half-time operators," he continued. "Previously, we needed nine full-time operators to handle half this volume.

"Consequently, we are processing twice as many transactions with the addition of only four half-time operators," he said. "By contrast, if we were still operating a conventional punched card data entry system, we would need a second shift with five or six operators and a supervisor to handle our current volume.

to handle our current volume.

"Operation of the key-to-disk system has thus enabled us to double our transaction volume while, in effect, putting a lid on staff expansion," he explained. "This has been made possible by the increased productivity provided by the system."

Previously, for example, Midland's card punch operators averaged 10,000 to

11,000 keystrokes an hour. Now, trainees on the key-to-disk system average 12,000 to 14,000 keystrokes/hr, experienced operators consistently average 16,000 to 22,000 keystrokes/hr, and the lead operator goes as high as 29,000 keystrokes/hr, according to Masterson.

according to Masterson.

"Furthermore, we are achieving this increased productivity at less cost," he noted.

"The switch from card punching to key-to-disk operations, for example, is saving \$1,400/mo in card and storage costs, more than double the additional cost of operating the key-to-disk system. In addition, costs are being reduced in several other ways, he said.

Operator Error Eliminated

"The editing capabilities provided by the key-to-disk system, for instance, have practically eliminated operator error with the result that the percentage of good batches going to the computer has increased from 5% to 75%," he said.

This has, in effect, shifted a great deal of editing from the computer to the key-to-disk system, freeing up the computer for other processing jobs, he reported.

"Mainframe time is also being saved because "the speed of data input to the computer is greatly increased," he added. "Previously, card data was input at 866 char./sec and it took about an hour a day. Now, data is entered at 84,000 char./sec (without card jams) and it takes only five or six minutes a day.

A separate, time-consuming operation of balancing card data on a tab machine has also been eliminated by the key-to-disk system.

"Due to increased batch accuracy, auditing time is also substantially reduced below what it would otherwise be if we were still punching cards," he said.

"Previously, 2.5 auditing clerks were required. Now, even though our volume has doubled — only three clerks or an additional half clerk are needed.

Service Greatly Improved

"In addition, the service or turnaround time we provide to our retail cooperatives is greatly improved," Masterson added. "The majority of transactions are now processed in 24 hours instead of three or four days."

Midland has internally developed about 50 different programs for use with the key-to-disk system. Prepared by a computer programmer, programs are made as sophisticated as possible to not only simplify data entry operations, but free up mainframe time, Masterson said.

"We design editing capabilities into the key-to-disk rather than mainframe system because it's simpler and saves time," he added.

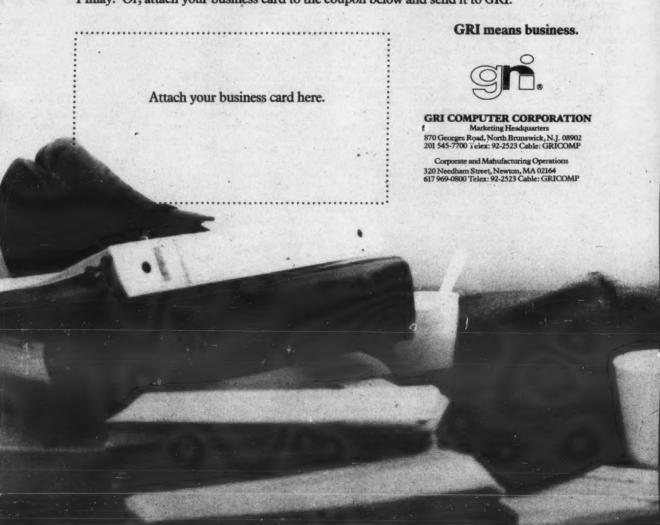
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<u>User Survey — Part 2</u>

Study Cites Prime Factors in Data Base Organization

This is the second article in a two-part series dealing with distributed data entry. This article deals with file handling, control and data security.

By William J. Moore

Special to Computerworld

In addition to data entry and software editing, the Inforex, Inc. study of 50 users' plans for distributed processing uncovered five factors important to users organizing remote data bases: file structure, integration frequency, local control, error recovery and security

System designers working with users must determine what files should be stored at remote sites. In making that determination, they should consider the trade-off between communications costs, if most files are centrally stored, and the costs of replicated on-line storage, if files

are stored locally.

If files are to be stored locally, storage equipment must have expansion flexibility, from as little as 10M bytes to more than 200M bytes.

In addition to considering communications costs and storage costs, designers should consider the frequency at which local files must update or be refreshed by central data base, according to the

After determining file location, system designers must determine the most appropriate file access technique for each application.

A distributed processing system should be able to support simple sequential, in-dex sequential and direct access methods.

Regardless of the access method se-lected, the study indicated remote site

managers will eventually want the option of creating their own formats and their validation procedures.

The best of both worlds may eventually e a simple, easy-to-learn, limited instruction set which would allow remote site users to cope with changing document formats and access simple but powerful validation techniques as department procedures change and higher level systems do not change.

Distributed processing systems users will want the records they retrieve to be presented in a familiar format and will want the ability to conduct simple and complex searches for selected data with minimum keystrokes and little specialized operator training required.

That requirement implies the use of a predetermined set of commands which be initiated with a single keystroke.

In addition, users will want multiple-file access to permit data to be retrieved and inserted in a record while that record is displayed on a terminal screen.

The act of updating that record should simultaneously update all pertinent rec-ords stored in other files. An automatic record protection system is also important so that simultaneous updates or dele-

tions of a single record can be prevented. Finally, users will want the ability to search for a record under alternate keys.

Reliable hardware and software will minimize the need to use error recovery techniques, and the quality and responsiveness of a system vendor's field service operation is a prime consideration for any system user.

But even the best systems fail on occasion, and system vendors should be responsible for providing a transaction logging scheme to inform local site managers of what records had been transferred or updated immediately prior to failure

A good error recovery scheme will also include, for example, a facility for copying files from disk to tape.

Security Concern

Users are concerned with the ease with which they can enter and access data in a distributed processing system. They are equally concerned with the security of that data.

File security planning must take honest mistakes and dishonest mistakes into account. Class checks, range checks and table lookups with insertion are data enfeatures which aid security by preventing honest mistakes. Dishonest mistakes can be minimized by locking terminals and by protecting files with password

In addition, it should be possible to prevent certain terminals from performing specified functions, particularly up-

dating.

The fourth basic element in any distributed processing system, in addition to data entry, data editing and file management, is a flexible communications capability

The buzzwords associated with data communications make the topic appear confusing, but network design simply in volves functional layers, beginning with communications channels.

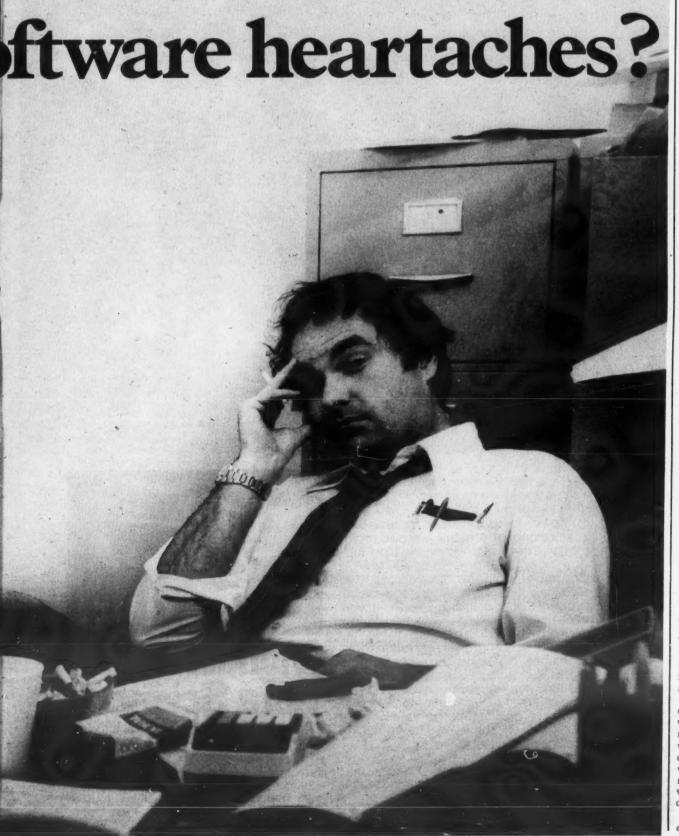
Regardless of the complexity of a communications network, communications channels will be point-to-point, multipoint or loop. The selection of modems, multiplexers and concentrators is a func-tion of the network's performance requirements and users must be aware of price/performance trade-offs.

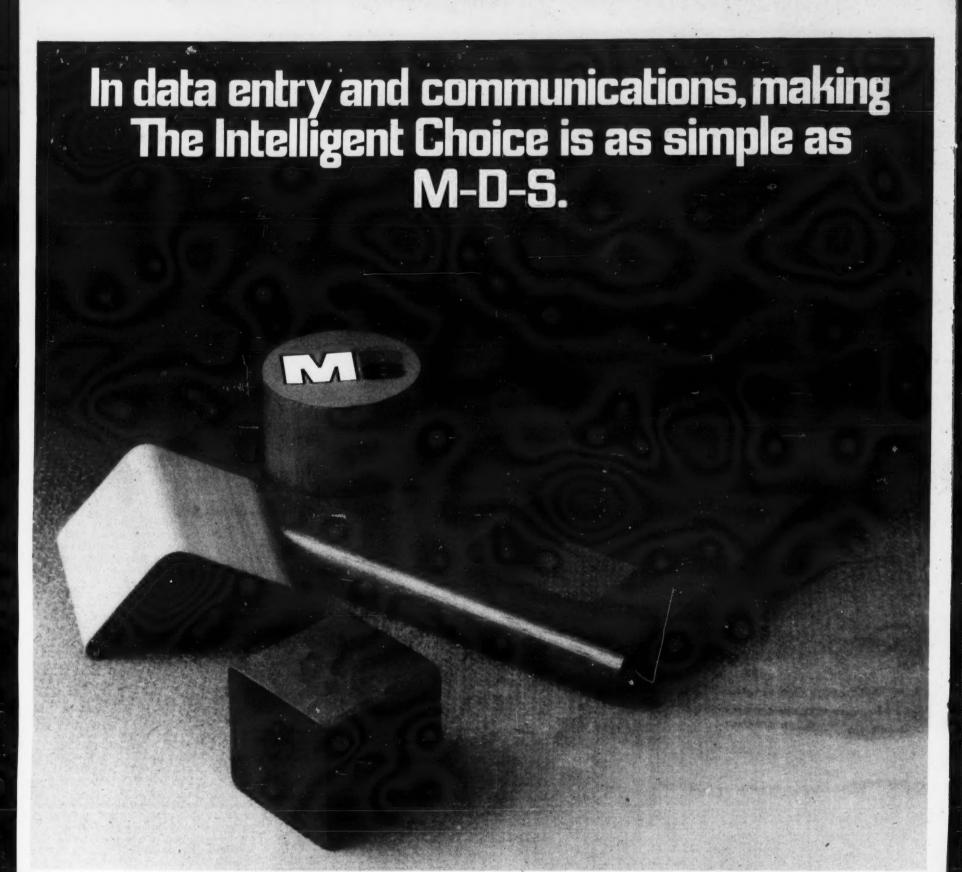
Terminals in a network must be flexible enough to handle a variety of applications and provide the ability to handle either Ebcdic or Ascii code in conjunction with an industry standard protocol.

Users should demand devices that have double buffering or the ability to perform an I/O function while performing a communications activity at the same time. They should also demand interleaving, which is tied to that philosophy of dual data paths and data compression and involves compacting strings of like characters in a data stream.

In addition to a network pass-through capability, distributed processing systems vendors should offer terminal-to-terminal message capabilities since many users want that convenience; a batch transfer capability, allowing terminals in a network to operate in remote batch or remote job entry modes; down-line soft-ware loadings; and the ability to poll a conventional multipoint or loop network.

Moore is vice-president of domestic operations at Inforex Inc., Burlington, Mass.





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Communications, Software Enhanced

Decentralized—Not Distributed—Minis Theme of '76

By Esther Surden

Of the CW Staff

Although the predicted move toward distributed processing never really took hold during 1976, many users did decentralize their DP operations.

While much lip service was paid to the theory that the entry of minis in end-user situations would obsolete the DP department, the data centers still had plenty of work to do after decentralization.

However, anticipating that future users will want to step up their distributed processing applications, the vendors took pains to introduce products with enhanced communications capabilities.

Small business systems also proliferated in 1976, giving the first-time user more confusing options.

And it was also the year in which Cobol

became a reality for small systems as more and more business applications began to erase the image of this mini as only a scientific or laboratory system.

To fill in the gaps at the low end of the miniworld spectrum, micros continued to emerge in control situations.

Users continued to send messages to endors stating service maintenance and standards were priorities.

And 1976 was the year in which IBM decided to get into the mini arena with the November introduction of its Series/1 (see story below).

Word Processing

It was also a time when data processing and word processing merged on already available systems. Digital Equipent Corp.

system with an addition to its Datasystem line. Then, at the National Computer Conference (NCC) in June, IBM came along with a word-processing version of its System 32.

IBM also added models to its 3 line twice during 1976; January saw the intro-

A Look Back

duction of the entry-level Model 4 and the 3/15D made its appearance in June.

Other Mainframers Active

The other mainframers on the mini scene were no less active. Honeywell Information Systems, Inc., for example, introduced a modular line of minicomputers with single-bus design in January The Series 60 Level 6 systems were oriented to both end users and OEMs.

Burroughs Corp. made a splash with its B80 small business system. The B80 included a double-sided floppy, extending the capabilities of this type of equipment.

NCR also made an appearance in the small systems arena with the debut of its entry-level Century system and the NCR 499, an updated version of the 399 for small business users.

Mini Makers Bustled

The mini makers were also busy bustling products onto the user stage. Data General Corp. (DG) introduced a passel of products and made its entry into the microcomputer market with the Micro-

DG also extended its Nova 3 line and top-of-the-line Eclipse system with a complement of software for commercial transaction-driven applications.

DEC, the largest mini maker, had a fairly quiet year with expansions in the small business DEC Datasystems lines representing its primary emphasis. DEC provided a path for users with Series 300 systems to upgrade to its Series 500 line.

Hewlett-Packard Co. had two minicomputer entries last year, the 1000 Series and 3000 Series II. The 1000 Series, introduced in system form, essentially replaced the firm's former 21MX systems while the 3000 Series II was an updated, redesigned 3000.

Prime Computer, Inc.'s 400 system, comparable to the large DEC PDP 11/70 for time-sharing users, was introduced in February.

In April, Wang introduced a family of minicomputers that included a portable unit and workstations. April welcomed Logical Machine Corp.'s update of the Adam family of systems for the first-time

May's Entries

In May, Modular Computer Systems introduced its entry-level Modcomp H.
Datapoint Corp. came out with a turnkey system and Computer Automation Inc. announced the Syfa system for distributed processing applications.

June was NCC month. Showing up at the conference were Harris Corp. with its Slash 6, Microdata Corp. with its Express, Four-Phase Systems with its distributed processing system and Modcomp Corp. with its IV/35 32-bit mini. Interdata also introduced systems on the high and low ends of its line.

And in November, Varian introduced a series of systems for multi-CPU nets.

The Main Event: An IBM Mini For the 'Sophisticated User'

By a CW Staff Writer

For the minicomputer user, the most significant event in 1976 was the November unveiling of the Series/1 from IBM.

This introduction marked the firm's first minicomputer fling and meant users choice. But this time, the had another new mini maker had a well-established reputation for support and service.

The Series/1 was no typical IBM system, however. It was designed for the "sophisticated user" and came almost completely unbundled from the control panel to the double-sided floppy disk.

When price comparisons came in, the Series/1 placed in the range of other medium-scale mini systems.

All this left a confusing picture for the user trying to decide which system to

The first two Series/1 users chose the unit on the basis of service, which may be the key since mini users have been complaining for years about the lack of vendor support from the traditional mini makers.

But coming in without software, the Series/1 paid little heed to the users' other chronic complaint – that good minicomputer software is lacking.

The traditional mini manufacturers who worked hard on software last year indicated full complements of software will distinguish their products from the IBM mini

Present. Future Developments

One thing is certain, however. Users should watch for future developments in the Series/1 line should this product follow the leads of other General Systems Division offerings.

These developments could come in the way of additional models. But for now, there are two processors, each with two submodels.

The Model 3A on one board fits into half of the width of a standard 19-in. rack and contains a card cage with four I/O slots. The Model 3B has 13 I/O slots. Both units feature a 64K-byte maximum memory storage capacity with an 800-nsec cycle time for the memory.

The Model 5A can accommodate up to 64K bytes of memory and has 8 I/O slots. The Model 5B can include up to 128K bytes of memory with three I/O slots. Memory cycle time for the Model 5 is 660 nsec.

Other developments could occur on the software level. While the Series/1 comes with a host of options and no standard higher level programming language, few observers said it will stay that way.

However, the modular pricing of such components, ranging from I/O devices to cabinets and control panels, is likely to remain a key Series/1 feature.

Another feature of the Series/1 that IBM spokesmen said will not change but many users would like to see altered is the "no discount" policy for multiple

IBM's egalitarian "same price to all no matter the size" policy will keep the multiple mini buyer looking at other al-

Level 62 Reconfigured for Expandability

Of the CW Staff
WALTHAM, Mass. - Honeywell Information Systems, Inc. (HIS) has redesigned its Level 62 small-scale systems to allow users to configure their own systems instead of being limited to the set configurations previously available.

The firm has essentially replaced the CPUs of the 62/40 and 62/60 with a single CPU that has the same instruction repertoire and basic architecture of its predecessors, but features field expandability, a spokeswoman said.

Level 62 systems can now be expanded on four levels of instruction execution speed, in memory and in the variety of peripherals that can be added to the systems.

Current Level 62/40 and 62/60 users can upgrade their systems in the field to the new processor, HIS stated.

An upgrade would involve the addition of circuit boards in already provided space and the cost of the upgrade would depend on configuration.

HIS would not say what the processor cycle times were for the four announced speed levels. However, the spokeswoman noted the second level is 25% faster than the "basic processor" and about equal to the present 62/40 CPU, the third level is 67% faster than the basic processor or comparable to the 62/60 and the fourth is 117% faster than the basic processor.

The Level 62 memory can be expanded from 48K to 224K bytes of 4K-byte MOS memory. The system can be configured to operate in a card or cardless environment, in mono- or multi-programming mode or in a batch and communications environment, the firm said.

HIS announced the availability of additional peripherals for its small-scale sys-



Honeywell Level 62 Entry-Level Configuration

A 100- to 300 line/min printer with 120 standard print positions, low-capacity 20.13M-byte disk drives and a diskette subsystem with transfer rates of 31K byte/sec were introduced.

Each diskette in the subsystem accommodates 256,256 bytes of storage. The diskette drive subsystem can be located beneath the right-hand edge of the console. HIS said.

Also announced was software for the system, including Universal Total Level 2 data base capability and a remote text editor.

Applications programs include a production scheduling and control system package for the manufacturing industry and a comprehensive sales order processing system which handles the activities related to the acceptance and analysis of

The remote maintenance capability previously announced for the Level 62 is provided with the system [CW, Dec. 13]. The additional maintenance processor althe firm to determine the parts needed or amount of specialized training required to cope with a particular problem before a field engineer is dispatched, HIS stated.

An entry-level Level 62 configuration includes two disk units with 40M bytes of storage, CPU with 48K bytes of main memory, console printer, diskette unit

and a 100 line/min printer.

The system costs \$1,747/mo on a sixyear lease or \$83,907 if purchased.

A large configuration includes 480M bytes of disk, 80-column card reader that operates at 500 card/min, CPU with 224K bytes of main memory, control panel, 120 char./sec printer, diskette unit and 1,600-line/min printer.

The system leases for \$7,429 on a six-year contract and costs \$333,655.

HIS is offering one-, five- and six-year lease plans on both the CPU and peripherthe spokeswoman noted from 200 Smith St., Waltham, Mass, 02154.

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Mini System Tightens Controls For Schools' Business Office

TEWKSBURY, Mass. — A minicomputer at the school district here is providing increased control over source documents by allowing the documents to remain at the superintendent's office where decisions are made and inquiries are answered.

By keeping original purchase orders and vendor invoices at hand and entering data from them and payroll and budgetary transactions directly into the computer, the office staff retains full control over the paperwork and full responsibility for processing, according to John F. Ryan, assistant superintendent of schools for business.

Also, the equivalent of a clerk's time has been eliminated and errors, due mostly to excessive handling, have been reduced, he stated. Equipped with an NCR Century 75 minicomputer for administrative and educational functions, the Tewksbury School District has installed an NCR 7200 data entry terminal in the superintendent's office for direct access to computer records.

"This means that the people responsible for the work are doing the actual inputting and can sight verify for accuracy," Ryan reported.

The terminal enables the office staff to access the system for information, such as the status of any one or all of the district's 375 operating accounts.

trict's 375 operating accounts.

"We simply take the data files from the mini and put them on display," Ryan said

Negligible Cost

For all this the cost is negligible, according to Ryan.

The alternative would have been for the district to replace a worn-out bookkeeping machine. The difference between that and the cost of the on-line batch system, when prorated over three years, is minimal, Ryan contended.

The system has also saved clerical time in the superintendent's office where personnel typed up bill schedules and vouchers and ran adding machine tapes connected with 5,000 to 6,000 vendor checks issued per year, he said.

Also eliminated was the six to 10 days spent every two weeks for one person to type up payroll and retirement documents, he added. There are 545 on the district payroll, including 400 faculty.

The district put a stop to the flow of much of the business paper that passed between the superintendent's office and the minicomputer six miles away, Ryan explained.

Needed to Ease Workload

Tewksbury, a Boston suburb of 25,000 people, has eight elementary schools, three educational wings (rented facilities), a junior high school and a high school. Total enrollment exceeds 6,900.

Like many school districts, Tewksbury was drawn to DP to ease the workload caused by an increase in student population and staff, according to Ryan.

In 1969, the district phased out some Tab Products Co. bookkeeping machines and manual functions and turned to an outside computer service and automated DP he said.

The district installed a Century 50 minicomputer in 1973 after requesting bids, according to Tom Lovett, DP coordinator.

The NCR was chosen over systems from IBM, Burroughs, Wang and Honeywell because it had the "best hardware and software for the price," he added.

Under the direction of Lovett, the district has built up a computer file of personal histories on all students, kindergarten through 12th grade. The system also maintains attendance records and issues monthly registers.

Student schedules for grades 7 through 12 are sorted out by the system. In the junior high school, three buildings and a rotating schedule are utilized. Students in the senior high school are programmed for three continuous overlap sessions between 7 a.m. and 5 p.m., Lovett stated.

'Verbal Report Card'

The system at the school district provides a "verbal report card" prepared by the teachers, Ryan said. The teachers are given 39 printed comments from which to choose three that apply to each student, he explained.

Census reports for the state are prepared twice annually on the mini, listing each student's age, sex and school among other things.

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DG Adds 3330-Type Disks

SOUTHBORO, Mass. – Data General Corp. (DG) has 96M- and 192M-byte IBM 3330-type disk storage subsystems for its Eclipse and Nova mini-

Manufactured in-house, the systems are moving-head pack devices for the larger members of the DG mini line. Data density is 4,040 bit/in.; the data transfer rate is 806,000 char./sec.

The subsystems include error correction. An error-correcting code is added to data in every track sector, allowing the subsystem to correct all error bursts of 11 bits or less, the firm claimed.

Independent command and read/ write channels within the subsystem can be multiplexed in dual-processor systems to allow the subsystem to accept and process a seek instruction for one drive while the control is servicing a read or write instruction for

another drive, according to DG.

The control can also store a read or write instruction for a drive while that drive is seeking a location, the firm

A reserve command feature allows the user to reserve one of the drives for the processor selecting that drive without restricting access to drives by the other processor; this is beneficial in implementing privileged file structures for security in large data bases, a spokesman explained.

The systems are supported under the recently introduced Advanced Operating System as well as under mapped and unmapped versions of the RDOS for multiterminal or batch processors, DG said.

The 96 M-byte subsystem costs \$24,950; the 192M-byte subsystem costs \$29,950 from DG at Route 9, Southboro, Mass. 01772.

Tealtronic Offers Series 2500 For Entry-Level Business User

CRANFORD, N.J. - Two entry-level, diskette-based small business have been introduced by Tealtronic of

America, Inc.
The Series 2500 includes the Model 2500 billing and accounting system for stand-alone business applications and the Model 2541 data entry system primarily for remote data entry environments, the

The systems are said to be in the performance range of the Datapoint 1100 diskette series, Digital Equipment Corp. Datasystem 310, IBM 3741 data entry device and Wang Laboratories WCS systems.

Both systems are based around a microprogrammed pico processor which is said to permit simultaneous execution of a variety of logic and I/O operations.

Up to 32 devices can be accommodated by a Series 2500 system, Tealtronic stated.

Memory for the systems is 600 nsec MOS. Up to 64K bytes can be accommo-

dated in 4K-, 8K- and 16K increments.

The Series 2500 uses diskettes that are IBM 3741-compatible. Up to four diskette drives can be included.

Operating under the Tealtronic-supplied Interpreter control program, the Series 2500 uses Application Control Language

The basic 2500 workstation processed with CRT and 16K of user memory colors \$8,500. A diskette drive module with wo drives costs \$2,750.

A variety of printers can be atta ned to the system, Tealtronic said from 14 Commerce Drive, Cranford, N.J. 07016.

Olivetti P6060 Mini **Designed for Novices**

NEW YORK - The P6060 Personal Minicomputer from Olivetti Corp. of America was designed for "noncomputer people who want an interactive and intelligent device on their desk," according to a spokesman.

The system includes up to 80K bytes of random-access memory; a single- or dual-floppy disk unit; a 32-character CRT; an 80 char./sec, 80-column thermal printer; an alphanumeric keyboard with 10-key pad; and a monitoring console.

Connects to Disk Unit

The P6060 can accommodate up to eight input and eight output devices or eight combined I/O units via two stan-dard character-serial I/O channels. An RS-232C interface allows connection to a larger remote system for time-sharing applications, the company noted.

In addition, a direct memory access channel is available to allow the P6060 to connect to a 10M-byte moving-head disk

Programmable in Olivetti's Extended Basic, the system can use programs from existing Basic libraries, the firm said.

A basic configuration with 8K of memory, one floppy disk and the thermal printer costs \$7,950. Olivetti is at 500 Park Ave., New York, N.Y. 10022.

Micro Diskette Drive Available for OEMs

NEWPORT BEACH, Calif. - An OEM miniaturized diskette drive from Wangco, Inc. accepts a 5.25-in. diskette for micro-computer applications, the firm said.

The Model 82 accepts hard-sectored diskettes of 10 sector/track or a modified IBM-type soft-sectored format, the firm noted.

Data storage can be extended "as high as 498.8K bytes per disk" via double-density encoding techniques and an optional feature that permits recording on both sides of a standard diskette, the company claimed.

Extra Storage

The basic, unformatted capacity of the Model 82 is 109.4K bytes on 35 tracks. To expand that capacity without altera-tion of media or encoding, the user can address an additional five tracks on any diskette for a total of 40 tracks and storage capacity of 124.7K bits, Wangco

The track-to-track access time is 30 msec; random average seek is 370 msec.

The basic unit sells for about \$300 in OEM quantities from Wangco at Suite 204, 2503 Eastbluff Drive, Newport Beach, Calif. 92660.

Hughes' low-cost C-9 display terminal makes a minicomputer work like a giant.

More for your maney
The new C-9 terminal offers high resolution, selective erase, sorial interface (standard), and several other features otherwise offered only by units costing almost twice as much—like 17-inch diagonal, 1029-line-scan, cathode-ray-tube video monitor with high light output screen for easy daylight viewing... computer independent zoom and pan...a jaystick for graphics and alpha-numerics interaction...a hardware graphic processor for scaling and rotating graphics and alpha-numerics.

The architecture of the terminal

embodies a micro-processor driven by micro-programs contained in read-only memories. A serial interface connecting the detached keyboard to the CRT display eliminates restrictions imposed by parallel interfaces used in other models.

Optional features
You can extend the C-9's capability even further with options like enhanced graphic hardware package with rotations, reflections, and line-texturing features or programmable gray levels for graphics (16 levels) and digital raster continuous tone images (256 levels). We also offer parallel interfaces for a variety of minicomputers and interfaces to popular digitizers for local data input and control of the interactive CRT cursor.

The new C-9 offers a continuous writing mode and a new capability which guarantees that writing occurs only during

Smoother curves and lower costs
The patented Conographic™ generator,
using conic curves to plot curvilinear information, produces smoother curves from
much less data, thus requiring less computer
memory, simpler software, less computer or
telecommunications time. Result: The lowest
total cost of ownership of any graphic
terminal available today.

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are available, including a new set of
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To find out how your minicomputer can
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Some Ingenuity, a Small System Help Non-DPer Open DP Service

BUCKINGHAM, Pa. - With a bit of ingenuity and a small business system, even a nonprogrammer can open a service bureau, according to Dick Paulus of Buck ingham Business Services here, who said he did just that.

Paulus knew his business - fuel oil distribution – but nothing about computers when he decided he needed a more powerful device than the accounting machine he was using to provide payroll services to fuel oil distributors.

The logical choice was a minicomputer, he said. Paulus looked at several systems from Burroughs Corp. and Basic Corp. before deciding to get a Microdata Corp. Reality system.

Ease of programming was the primary reason for the choice, Paulus said, because he needed a system that a nonprogrammer could use. Helped by the dealer in learning the system's language, Paulus designed a package for fuel oil dealers.

Buckingham's fuel oil system provides service in four general areas: budgets (including estimating budget payments for the new heating season as well as providing collection data), credit, delivery and

Delivery tickets printed by the system include such information as degree day due, mid-point to run out and run-out degree day in addition to the usual customer name, address and credit information. Buckingham's customers get a daily transaction report in account number order, a summary of daily activity by prod-uct code and the net change to accounts receivable, the actual accounts receivable balance and a list of customers who are

overdue for delivery.

At month-end they get a delivery efficiency report showing by tank size the average quantity delivered, an aged trial balance for amounts up to 120 days as as outstanding finance charges, monthly statements separated into budget and regular and a monthly summary which lists every product code having had a transaction that month, the corresponding quantity and the net change to accounts receivable.

Linked by Phone Lines

The first customer came on-line in October. The Philadelphia fuel oil dealer keys into Buckingham's computer, some 20 miles away here in suburban Buckingham, via ordinary telephone lines.

The present Reality system, which consists of 24K of core memory, a 10M-byte disk, an 800 bit/in. backup tape, two Prism CRTs and a 165 line/min printer, can accommodate up to four dealers,

When business warrants it. Paulus plans to expand the system to 64K of core and a 40M-byte disk - or more, if needed. The system's expansion constill another selling point for Paulus, he said.

Small Sites Overlook **Problem of Humidity**

By Floyd W. Carlstrom

Special to Computerworld
MADISON, Wis. — One problem frequently overlooked in smaller DP installations is the level of relative humidity in the DP department, especially during the heating season.

When cold, outdoor air is heated, it has a greatly increased capacity to hold mois-ture. For example, if the outdoor relative humidity is 70% and the outdoor temperature is 20°F, the indoor relative humidity in a building that has no humidity added is about 10%

That's far from the 40% to 50% range equipment manufacturers many recommend.

When the relative humidity is maintained at 45%, static electricity is greatly reduced; punch cards and business forms don't stick together and cause feeding problems.

Proper humidity also prevents tapes from expanding or curling.

Because DP systems generate heat, the air in the room tends to be even drier than normal. Frequently the heat load is great enough to call for cooling equipment, even during the normal heating season

With the problem of dehumidification or moisture being removed from the air, the "dry air" problem is aggravated. The installation of a humidifier can help solve

these problems.

Carlstrom is with Research Products Corp. in Madison, Wis.

Burroughs users! Now you can eliminate your Achilles heel.

Would a large international bank and thousands of other commercial operations throughout the world use Burroughs computers unless they were very good? Obviously not.

But would the same large international bank, a large bank service company and many other commercial operations substitute IBM-1403's for their Burroughs printers, unless they felt they could improve their printing

Are quality and reliability of printing your Achilles heel?

If so, we have a simple solution. Adapt an IBM-1403 model -2, -3 or -N1 to your Burroughs system with our Grumman printer controller. The proven quality, speed and reliability of the IBM-1403's should dramatically improve the performance of your printing operations.

Your cost will be nominal. One Burroughs user says he can pay for our printer controller with the savings on ribbons alone. In any case, if you've been paying for extra printing capacity to solve reliability problems, you'll be more than happy with the IBM-1403.

Of course, printing quality and total output are not just Burroughs problems. We are delivering our printer controller to users of CDC, DEC, Univac, Xerox and other computers to solve similar problems. Commercial, educational, scientific, military and computer service bureaus are among our printer controller users.

For multi-vendor installations we can add a switch to your controller to allow you to connect the IBM-1403 to either of two different computers.

You can rent, lease or buy both the printer and controller. For full information, call or write Joe McDonough, Grumman Data Systems Corporation, 45 Crossways Park Drive, Woodbury, GRUMMAN New York 11797. (516) 575-3034. Telex: 96-1430. TWX: 510 221-1842.

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Cl Notes

CCIA Offering Daily Digest Of Calcomp vs. IBM Trial

WASHINGTON, D.C. - The Computer and Communications Industry Association (CCIA) is offering a daily Trial Monitor service to keep interested persons up-todate on happenings in the California Computer Products, Inc. (Calcomp) vs. IBM antitrust trial.

The digest of transcripts, prepared by Timothy J. Shearer, a Washington, D.C., attorney specializing in antitrust law, is available three days after each trial day. The price of the first 120 days of Trial

Monitor is \$550 to CCIA members and \$675 to nonmembers or \$7.50 for a single day

The service is available free to the press. Additional information is available from Robert Negran at CCIA, 1911 N. Fort Myer Drive, Rosslyn, Va. 22209

Amdahl in West Germany

SUNNYVALE, Calif. - Amdahl International has formed Amdahl Deutschland GmbH, based in Munich.

The firm expected to deliver its first system in December to Max Planck Gesellschaft zur Forderung in Munich.

A second 470V/6 was also slated for December shipment to Germany

Supershorts

Centronics Data Computer Corp. will obtain mechanical assemblies for its forthcoming medium- and high-speed line printers from two subsidiaries of Hitachi

Lear Siegler, Inc. delivered its 20,000th CRT terminal within six months of producing its 10,000th unit.

Milgo Electronic Corp. has formed a Brazilian manufacturing firm in conjunction with Coencisa Construcoes Civis Ltda. The new firm, of which Milgo owns 49%, will make and market its data communications products in Brazil.

The Communication Products Section of the Canadian General Electric Co. Ltd. has been selected as Canadian distributor of Applied Digital Data Systems, Inc. products.

Business Improved

Lines Blended, Trends Continued in '76

Of the CW Staff
The year 1976 could be characterized as a time in which lines between formerly distinct areas of the DP environment blurred and perhaps even merged.

Where are the cutoff points between

mainframes and minis? Minis and micros? DP and communications?

was a good year for most firms, booming for many and notable for the continuation of trends evident last year.

In the services area, there seemed to be an increasing awareness that the competitive edge lies in specialized services rather than raw time. Consolidation continued apace, marked by larger time-sharing firms expanding their base of operations through acquisition of regional time-sharing firms as well as batch bu-

Software firms saw the volume of both utilities and applications packages grow. International Data Corp. estimated revenues of packages in 1976 would be \$350 million, growing to \$465 million in 1977. International Computer Programs, Inc.

added 29 packages to its \$1 Million Club in 1976 and 35 to the \$2 Million Club.

Although the impact has yet to be seen, IBM and Honeywell Information Systems respectively entered and returned to the mini area with flourishes.

In the peripherals area, several vendors that had watched Centronics Data Computer Corp.'s earnings grow over the years decided printers are perhaps where the peripheral action is and entered the fray.

Blurring Distinction

Mini makers indicated they're not sure they want to be called minicomputer firms any more, since their products can carry substantial power as well as price

Just as the line is blurring between mainframes and minis, so too is the distinction between minis and micros. Many minis incorporate micros, not only as I/O controllers but as the heart of the sys-

Speaking of incorporating micros, some mini firms made real the long-espoused philosophy of vertical integration by setting up their own semiconductor facilities and incorporating these yields into their product lines.

Data General claimed to be producing the chips forming the Micronova and Digital Equipment Corp. dabbled in semiconductor efforts.

The Hewlett-Packard Co. (HP) also has its own lab. Some observers suspect its new System 1000 and the yet-to-be-intro-duced CPU in that system incorporate micros of HP design and production.

Minis also found a growing outlet in systems houses that put together small

A Look Back

business systems, manufacturers reported. As a reflection of the blending of DP and communications, the Computer Industry Association added "Communicato its name.

Bell's Dataspeed 40/4 raised such a flap t made IBM a bedfellow with the Computer and Communications Industry Association and The Computer Business Equipment Manufacturers Association.

In other areas, IBM apparently became the lone occupant in the territory of ink jet printing used with DP, which some observers expect to heavily impact certain segments of the industry.

IBM sneaked the product in with a new word-processor version of the System 32 and also began offering ink jet printing on a machine marketed to the office equipment buyer.

large-scale peripherals business seemed to be more sedate in 1976 than in the past. Although several firms announced they would follow IBM's 3350 announcement with their own version of the high-capacity drive, very few brought out such a product and at least one, California Computer Products, Inc., Products, Inc., renounced the effort

Increased Leasing of Terminals

There seemed to be an increasing number of firms engaged in leasing terminals. Many of these offered shorter term leases than did the manufacturers, thus providing users with flexibility.

In terms of methods of doing business, IBM continued to observe a large portion of its quarterly revenues were being generated from outright sales rather than

But in the area of smaller machines, IBM's tradition of leasing, carried on by the 32, may have impacted other manufacturers' revenue bases.

For instance, early in the year, Burroughs noted it was leasing an increasing portion of its small systems base

Keep AT&T Out of EFT Market, Adopt Standards, CCIA Urges

Communications Industry Association (CCIA) has asked the National Commission on Electronic Fund Transfers (EFT) to establish a standards commission and to foster competition by excluding AT&T and its subsidiaries from participation in the EFT arena.

A federally chartered Computer and Communications Standards Board could provide the impetus for standardization in the EFT area that will allow broad compatibility of equipment at less cost to the consumer, CCIA President A.G.W. (Jack) Biddle told the commission at a recent hearing here.

The other alternative, Biddle said, is a monopoly such as the present one in the telephone area.

However, Biddle stated, a monopoly in EFT is not justified since the supplying of tional earmarks of a natural monopoly."

The systems are little more than "networks of terminals and business computers . . . EFT systems in general should be regarded as DP services and AT&T and its subsidiaries should be kept out of this market," he said.

"This commission needs to be made keenly aware of the serious consequences that derive from any decision which allows Bell to provide EFT-related services," Biddle warned.

Once Bell enters the EFT market, most competitors will be "threatened with extinction due to Bell's cross subsidies, predatory pricing practices and passing on of its costs to the telephone rate payers, Biddle contended.

The major problem facing the commis-(Continued on Page 36)

Datapro Salutes the Software Winners!

Here are the top 38 software packages out of 1,446 as determined by user ratings in Datapro Research Corporation's 1976 survey of 30,000 computer system users.

1976 Datapro Software Honor Roll

ALLTAX Management Information Service ASAP Universal Software, Inc. CA-SORT II Computer Associates, Inc. CYTOS DNA Systems, Inc. **DFAST** Oxford Software Corporation **DIOPEN IBM Corporation**

DISKPLAY Boole & Babbage, Inc. Disk Utility System Westinghouse Electric Corporation

DYL-250 Dylakor Software Systems, Inc. DYL-260 Dylakor Software Systems, Inc.

EASYTRIEVE Pansophic Systems, Inc. 1130/FORTRAN DNA Systems, Inc. 1130/SORT DNA Systems, Inc.

EPAT Software Design, Inc.

Fast/Dump/Restore Innovation Data Processing, Inc.

FMAINT Software Design, Inc. GRASP Software Design, Inc.

IDMS Cullinane Corporation IMAGE Hewlett-Packard Company

IMSL IMSL, Inc. LIBRARIAN Applied Data Research, Inc.

LOOK Applied Data Research, Inc. Minicomm Informatics, Inc.

Optimizer II Capex Corporation PANVALET Pansophic Systems, Inc. RELO-PLUS Universal Software, Inc. RPG II (360/370) IBM Corporation

SAS SAS Institute, Inc. SLICK NCI, Inc.

Software 1040 SAB, Inc.

SPSS SPSS, Inc.

SYNCSORT Whitlow Computer

TFAST Oxford Software Corporation TLMS Gulf Computer Sciences, Inc.

TOTAL Cincom Systems, Inc. UCC ONE University Computing Co.

WATFIV University of Waterloo WESTI Westinghouse Electric

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- Send me the summarized results of the nation's biggest software survey. Includes user ratings of these 38 packages and 16 other high scorers, based on five performance criteria.
- I'd like the complete 1976 soft-ware survey reports, at \$12, with detailed ratings of 250 packages.

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CCIA's Biddle Asks Commission To Keep AT&T Out of EFT Mart

(Continued from Page 35) sion is that there is "no longer any technological distinction between DP and communications. The long-heralded marriage between computers and communications [is] now finally consummated in EFT," Biddle remarked.

He suggested the commission propose an amendment to the Communications Act of 1934 that would preclude AT&T's entry into the EFT marketplace as a

Telex Signs to Buy **UTC Terminal Arm**

TULSA, Okla. - Telex Corp. has signed a definitive agreement with United Technologies Corp. (UTC) for the acquisition of UTC's Terminal Communications, Inc.

The unit, which manufactures remote data terminals for communication applications, will be sold to Telex Computer Products, Inc. and will operate as a wholly owned subsidiary.

The agreement calls for an undisclosed amount substantially in excess of \$3 million and some notes, according to J.D. Bailey, Telex vice-president.

The unit will continue to operate in its North Carolina facility, he said.

The firms have many of the same instal-lations, he observed, adding the move will be a "synergistic saving." Service for terminals will be provided by a combination

of forces from both firms, he said.

Despite Telex's past troubles with IBM in the plug-compatible market, Bailey said there is no reason why Telex should abstain from entering new markets because of IBM's presence.

supplier of EFT equipment or services The amendment would also allow common carriers to supply EFT equipment or services only through separate length subsidiaries.

The Computer and Communications Standards Board would have equal representation from suppliers, providers, users, the general public and the government to act as a focus for national and international voluntary standards activities in EFT," Biddle said.

The Institute for Computer Sciences and Technology could act as technical sup-port and advisor and its funding be made available to the new board, Biddle sug-

As in the DP industry, the existence of standards in data communications "would clearly tend to increase competi-tion rather than to restrict it," Biddle

'Without standard protocols, the user will have to bear the burden of costly interfaces or be forced to look to a single supplier for all his communications needs," he added.

Biddle warned against the incursion of de facto standards which threaten EFT competition and cited AT&T and IBM as

sources of these types of standards. For competition to be effective in each area of EFT, standards are needed for four levels of access:

- User interfaces.
- Terminal-to-network interfaces.
- Network-to-computer interfaces.
- Network-to-network interfaces.

Network access itself has four levels of protocols: physical circuit, link control, packet level and application level, he

IBM 138, 148 Sold Quickly: IDC

WALTHAM, Mass. - IBM amassed 2,250 orders for its 370/138 and 1,500 orders for its 370/148 within a week of their introduction, according to estimates contained in a census prepared by International Data Corp. (IDC) and published in EDP Industry Report.

The 138s and 148s therefore emerged from the nest not as fledglings but as surefire sellers, the findings the market research firm indicated.

In comparison, the older 135 ac-In comparison, the older 135 accounted for 5,350 installations worldwide with 2,550 in the U.S., according to the census, dated July 1, 1976.

There were 3,490 IBM 370/145s installed at that time, 1,820 of them in the U.S. IDC estimated.

the U.S. IDC estimated.

But IBM wasn't the only manufacturer with new systems for which it received a bundle of orders. Burroughs amassed about 3,300 orders for its B80 and 50 orders for its B2800, IDC estimated.

An almost new system, the Digital Equipment Corp. Decsystem 2040, was first installed in June and had 20 orders pending as of July 1, IDC indi-

The IBM 3/4, also first installed in June, totaled 70 installations with 500 orders, according to the census.

IDC estimated Honeywell Series 60 units are generally more populous outside the U.S. than inside while IBM systems are more evenly split between international and domestic distribu-

For instance, the census listed 1,510 Series 60 machines outside the U.S. and 422 in the U.S. Of IBM 370s, 9,253 were in the U.S. and 10,588 outside the U.S.

DEC Expands, But Not in France

Corp. is expanding in many directions and locations, but apparently not in France.

The French government indicated to local officials in Annecy-le-Vieux it has rejected DEC's bid to build a 30,000 sq-ft plant there, according to a spokesman for the vendor.

DEC is looking at several other possibilities on the European continent, stockholders were told at a recent meeting.

In the U.S., however, DEC's plans are proceeding apace. The firm has bought 205 acres in Augusta, Maine, where it plans to build a minimum of 100,000 sq ft for manufacturing modules and subas-

In Hudson, Mass., DEC plans to build a

facility with a minimum of 100,000 sq ft Groundbreaking on a 600,000 sq-ft building in Merrimac, N.H., was scheduled to occur early in December. This will house some administration, engineering and marketing organizations.

In Salem, N.H., construction is under way on a 650,000 sq-ft facility to house final systems assembly and testing.

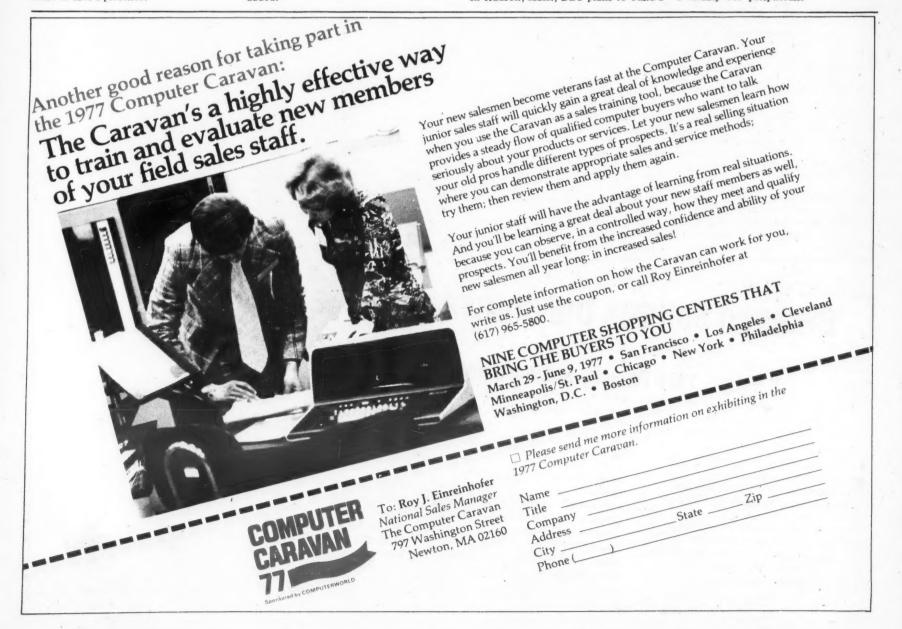
The firm plans to build a 130,000 sq-ft facility in S. Burlington, Vt., for the manufacture of subassemblies.

Meanwhile, in the western U.S., DEC completed the first phase of its Phoenix plant in July and the second portion in

plant in July and the second portion is

nearing completion.

DEC has bought 360 acres in Colorado Springs, Colo., on which it plans to build a facility for peripherals.



Corporate Casualties

Datran

By Toni Wiseman

Of the CW Staff
The Data Transmission Co., better known as Datran, passed away on Aug. 19 of this year. It had been suffering from long-term financial problems and competitive complications.

The youngest brainchild of Sam Wyly and a member of the Wyly Corp., Datran will be remembered as the first switched digital data service, a memory stamped in the minds of its users who were indescribably shocked by the sudden death rattle with only a few week's notice.

A two-week remission, thanks to Federal Communications Commission (FCC) intervention, did little to assuage users' fears and disillusionment.

The specialized common carrier had nearly succumbed earlier in the year, but recovered after a cash infusion from Walter Haefner Holding AG of Zurich, Switzerland.

Datran's user base was never large, totaling less than 150 at its peak, but the company will always be remembered as a feisty competitor, willing to take on the largest telephone and telegraph carriers.

"Our efforts to secure financing necessary to continue the business of Datran were seriously impaired as a result of AT&T's action to institute services at rates which were about 40% below Datran's rates," Sam Wyly said in his bankruptcy statement.

'In June of this year, administrative law judges of the [FCC] found certain of such AT&T rates to be unlawful, unreasonably low, anticompetitive, predatory and specifically designed to eliminate Datran.

"That Datran has indeed been eliminated is now a fact. The cause has been documented. We now look to the court for justice in this matter," Wyly said. Wyly has, in fact, charged AT&T with "first-degree murder." The suit, filed

in the U.S. District Court in Washington, D.C., seeks \$285 million in damages. Beyond these charges, there is the reputation of the business which has been severely damaged. It will be harder and harder after this to convince users who have already been burned once that there is an alternative to Bell, some eulogizers believe

While users had been fully aware of the financial instability of the fledgling carrier, most had been willing to take a "calculated risk" and take advantage of its capabilities rather than being restricted to "more conventional" types

Datran's passing was also courned by other carriers and some modem nanufacturers – the forme because of their fear of contamination by manufacturers - the forme association and thus a similar fate, the latter because Datran had been a good and valued friend, not to mention customer.

Singer Business Machines

By Toni Wiseman

Of the CW Staff
The computer industry was saddened by the passing of a venerable trouper this year when Singer Business Machines (SBM) lost its battle against the ravages of growing costs and competition.

The Singer Co. announced in January it would withdraw over the year from the manufacture and sale of its SBM product line, including retail tegminals

In his funeral oration, Singer Co. Chairman Joseph B. Flavin said that "although the potential of the division is still significant, its continued operations are no longer consistent with Singer's overall aims and financial resources.

At the time of its death, SBM accounted for only 11% of Singer Co.'s total 1974 revenues of over \$2 billion. In terms of losses, however, the division was a major contributor.

As a result, Singer Co.'s 1975 financial statement included provisions totaling about \$400 million for expenses and write-downs, \$325 million of which was directly attributable to SBM.

The firm's withdrawal from the computer and point-of-sale (POS) market followed the 1974 termination of its electromechanical billing and accounting product line, which led to a \$30 million write-off and a \$10.1 million net loss

in that year.
While SBM's installed base may not have been overwhelmingly impressive in terms of value per system or even total installed value, the number of Singer

users was impressive. These users, left somewhat in the lurch by the sudden termination announcement, rapidly became complacent when they got the feeling the support promised by Singer over the next five years would be sufficient for their needs.

It was the best equipment for the money, some users recalled.

After long weeks of speculation and rumor, Singer did indeed sign an agreement turning over maintenance and customer support functions to TRW, Inc.

The arrangement included a pledge by TRW to continue the manufacture of the Singer System Ten as well as to provide software maintenance and, in some cases, enhancements for systems already in use.

Overseas, Britain's International Computers Ltd. (ICL) bought manufacturing and marketing rights to the System Ten and POS systems. The agreement provided for the transfer of the main Cogar facility, which manufactured the System Ten, to ICL at the end of the year.

HIS Regroups Into Three Units

MINNEAPOLIS - Honeywell Information Systems, Inc.'s (HIS) North American Operations have been reorganized focus on product-oriented divisions.

The move concentrates marketing efforts on the U.S. and Puerto Rico, establishes three profit centers and combines federal domestic marketing and field engineering into a division.

"Successful growth throughout our computer business has caused us to restructure our operations in manageable, product-oriented divisions that will permit us to fully capitalize on fu-ture opportunities," according ture opportunities," according to C.W. (Clancy) Spangle, HIS president. The changes were effective Jan. 1.

Three Profit Centers

The three profit centers are the Large Information Systems Division in Phoenix and the Small/ Medium Information Systems Division and the Marketing and Services Information Systems Division, both headquartered in Waltham, Mass.

The new U.S. Information Systems Group, successor to the North American Operations, is responsible for marketing and ervicing in the U.S. and Puerto

Responsibility for marketing in Canada and Mexico was allo-cated to the Pacific Operations Group, which will be headquartered in Minneapolis.

Previously the organization in-

cluded federal systems, DP operations, field engineering, Canadian systems and North American systems, which had Phoenix, Boston and computer engineering reporting to it, a spokesman

Large Information Systems Division's responsibilities include product planning, engineering and manufacturing of large systems for HIS markets worldwide. This division will also handle the Multics program and development and support of Xerox computer systems serviced by HIS.

The Small/Medium Information Systems Division has two parts. The Minisystems and Terminal Operation is responsible for product planning, engineering and manufacturing of Level 6 minis and certain terminals for worldwide HIS markets. The General Products Operation is responsible in the U.S. for engineering support and refurbish-ment of all small and medium systems and peripherals.

The Marketing and Services Information Systems Division is responsible for marketing and systems support for all HIS computer products in the U.S. and Puerto Rico, including the Xerox products serviced by HIS.

The Federal Systems Opera-tions, responsible for computer sales to the U.S'. government, is also part of this division.

Lee E. Sheehan will head the

Information Systems Group; he previously was North American Operations vice-president and general manager.

Other than Sheehan, most appointees saw recent service in areas different from those of

their new appointments.

Norman N. Feldman, currently vice-president of the Product Management Operation in Minneapolis, was named vice-president and general manager of the Large Information Systems Division. Feldman is a former vice-president of the Phoenix Computer Operations.

James R. Pompa, vice-president and general manager of Federal Systems Operations, will become vice-president and general manager of the Small/Medium Information Systems Division.

Seymour Kraut, vice-president of Phoenix Computer Operations, is relocating to Waltham as vice-president of the Minisys-tems and Terminal Operation and Robert F. Anderson, vicepresident of Strategic Planning in Minneapolis, is relocating to become vice-president of the General Products Operation.
Richard R. Douglas, formerly

vice-president of DP Operations will be vice-president and general manager of the Marketing and Services Information Systems

Michael J. Keliher, a vice-president in the Product Management Operation in Minneapolis, joined this division as vice-president of Federal Systems Operations.

MISSISSIPPI STATE CENTRAL DATA PROCESSING AUTHORITY

Sealed proposals will be received by the CDPA, 508 Robert E. Lee Bldg., Jackson, MS, 39202, up until 2:00 p.m. 1/24/77, for the following data processing equipment:

Request for Proposal No. 272 for the purchase of an additional 64K words of memory for an existing DEC 1077 computer system with 192K words

of memory for an existing DEC 1077 computer system with 192K words of core memory.

Request for Proposal No. 273 for the lease or purchase of a remote job entry station with a minimum 18 data entry stations to operate as a HASP multi-leaving RJE with concurrent data entry capabilities.

Request for Proposal No. 274 for the lease or purchase of a minicomputer system to be used in the instruction of a computer sciences program at a small university.

Request for a Proposal No. 275 for the purchase of an alphanumeric keyboard, a plotter and T-connector to attach to a Wang 600 programmable calculator.

Detailed specifications may be obtained from the CDPA office. The CDPA reserves the right to reject any and all bids and proposals and to waive informalities.

Clyde P. Ballard, Executive Director Central Data Processing Authority

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Adapso Active on Many Fronts, Sees '77 as Time of Response

By a CW Staff Writer

MONTVALE, N.J. - The Association of Data Processing Service Organizations (Adapso) is moving on many fronts to represent the interests of its members.

Incoming President Lou Pfeiffer re-cently told the association its goal in should be to respond to changes.

Pfeiffer said he intends to tell the world the data services industry is not a fledgling industry, but one that is growing and to stay.

Adapso committees are active on issues ranging from electronic funds transfer (EFT) systems to taxation and software

In the EFT area, committee chairman William Fletcher indicated the Adapso stand will encompass the issues of network switching, whether the switch operator is permitted to also engage in data processing and if the switch should be

Fletcher's primary concern is the possible intrusion of banks into the DP services area through EFT, he said.

Alan Rievman, chairman of Adapso's tax committee, told the group 1976 was a year of "dramatic tax problems" for the data services industry. The biggest single problem, he added, was retroactive as-

sessment.

"If states prevail [in retroactive assessment], they will likely threaten the existence of the data services industry," he

Adapso has retained a law firm for advice and counsel on how to proceed in various states. Lawyers have advised soft-ware firms to collect sales taxes on products sold in New York State, he said.
Werner Pleus said the Privacy and Secur-

ity Committee has three aims: policy, education and liaison with government committees.

The committee is issuing to members a draft of security guidelines and soliciting

comments.

The Data Centers group has had a local market research kit prepared which it distributed free to Adapso members. The kit, prepared with the help of International Data Corp., was designed to give the individual data center mager the tools with which to conduct market re-

search in his locality.

The Manufacturers Relations Committee, headed by Bruce Coleman of Boole & Babbage, Inc., worked more closely with IBM in several areas during the past year, according to Jerry Dreyer, Adapso's executive director.

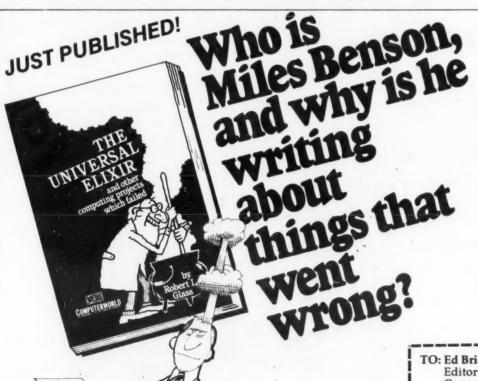
Coleman explained that when an Adapso member feels action by IBM people in the field deviates from an IBM policy, such as excessively long trial installations, the committee discusses the matter with IBM.

In addition, the group acts as a liaison with IBM when Adapso members, often not users of IBM machines, see the need for fixes in new software releases.

Year-End Cheer at HP

PALO ALTO, Calif. - 'Tis the season. Hewlett-Packard Co. (HP) distributed about \$13.6 million to more than 27,500 employees under its cash profit-sharing

This raised the total disbursement for 1976 to more than \$23.2 million, the largest ever, compared with \$21.4 million in 1975.



Just published by Computerworld, this unique treatise on tragedy contains a series of startling stories like these:

- How to Succeed at Admitting Failure
 An Exercise in Elaborate Inefficiency
- The Charlatan and the Nuclear Computer
- The Right Decision at the Wrong Time
 The Compiler Whose Beauty Was Skin Deep
- The Air Traffic Control Diversification Disaster
- The Sandbagged Computer Selection
- Turning the Empire State Building into a Church

PLUS (as if anyone cared) "Miles Benson" reveals the man behind the name - the true devotee of disaster and author of this entertaining, instructive - (and occasionally frightening) - book.

Don't fail to get this feast of failures! Success stories are everywhere (true or not), but there's more to be learned from failures. Unfortunately, failure is an orphan, and no-one wants to talk about it. This is your chance to get the straight story about some of the more interesting SNAFU's in the computer business. Don't miss it! Send in the coupon today.

Not many people aspire to become experts on failure, but the man behind the pseudonym "Miles Benson" has made a career-long hobby of things that go wrong in the computer business. Collecting information from contacts around the country, "Miles" retires to the back seat of his Studebaker where, for several years, he has turned out columns on catastrophes (and less spectacular failures) for Computerworld. Now he has compiled the best of the worst into a single book:

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Name Company_

Intel 8085 Offers 50% Improvement Over 8080

SANTA CLARA, Calif. – Intel Corp.'s 8085 microcomputer system is object code-compatible with 8080A and bus-compatible with 8080 components, but offers up to or more than 50% improvement in price/performance, according to the firm.

Only three chips are needed to build a complete system rather than 10 or more 8080 system components, the firm said.

Operating rate with standardspeed memory is 3mHz instead of the 8080's 2mHz. Throughput can be increased more than 50% in some applications by using new features.

The 8085 operates on a single ±5V supply for all components, including erasable programmable

read-only memories; the 8080 requires three different voltages.

Typical instruction cycle time

Microcosm

is 1.3 μ sec, allowing the system to be used in high-performance applications ranging from controllers to 8-bit minis, the firm said.

Equipment manufacturers may intermix components of the 8080 and 8085 systems, accord-

ing to Intel. However, the 8085 CPU and the 8080A are not pin-compatible.

A complete 8085 system may be built with the 8085 CPU; 8155 2K random-access memory, I/O and timer; 8355 16K read-only memory and I/O; or interchangeable 8755 16K erasable programmable read-only memory and I/O, Intel said.

Shipments in sample quantities are expected during the first quarter. Prices will be announced when available from stock, Intel said.

National Semi Unveils N-Channel Unit

SANTA CLARA, Calif. — National Semiconductor Corp.'s SC/MP-II microprocessor is an N-channel unit that is twice as fast and uses one-fourth as much power as the P-channel SC/MP 8-bit single-chip micro, the firm said.

The SC/MP-II operates off +5V, whereas the previous model required two power sources. Typical instruction execution time is 5μ sec and a microcycle is completed in 1μ sec, the firm said.

The unit is compatible with its predecessor in terms of pin configuration and object code. With slight modifications to the crystal frequencies, it will be compatible with all SC/MP support equipment, the firm indicated.

Micro Mania

Fairchild, Motorola Sign Alternate Sources Pact

MOUNTAIN VIEW, Calif. — Fairchild Camera and Instrument Corp. and Motorola, Inc. have agreed to exchange technology and provide alternate sources of each other's micros. Fairchild will manufacture and

Fairchild will manufacture and market Motorola's MC6800 microprocessor family, using photomasks and other aids from Motorola. It expects to begin shipments of 6800 components in the first quarter.

in the first quarter.

Fairchild will also produce Motorola's 8,000-bit ultraviolet erasable read-only memory and has an option to produce the MC10800 ECL 4-bit slice microprocessor family.

In return, Motorola will be an alternate source for Fairchild's family of low-power Schottky TTL logic and will have manufacturing rights for two Fairchild products under development — the one-chip F8 microcomputer and the 65,000-bit charge-coupled memory.

GI Licenses CP-1600 to ITT

NEW YORK — General Instrument Corp. (GI) has licensed International Telephone and Telegraph Corp. (ITT) to manufacture and sell its CP-1600 single-chip 16-bit microprocessor.



Sample quantities are available now at \$17.76 each. Production quantities of more than 1,000 will cost about the same as the P-channel SC/MP, "significantly below \$10 each," according to a spokesman.

National Semi is at 2900 Semiconductor Drive, Santa Clara, Calif. 95051.



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Sheraton Park—May 31-June 2

Boston, Northeast Trade Center-June 7-9

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Finding Trend Profitable

NCSS Focus on Market-Specific Services

NEW YORK - National CSS. Inc. (NCSS) is generating an increasing portion of its revenues from specific functional and industry applications, and President Robert E. Weissman expects the trend to continue.

Weissman feels NCSS can "compete successfully against IBM and others by supplying specific market segments with well-differentiated services," he

while basic time-sharing service accounted for 67.6% of 1974 revenues, it contributed only 53.2% in 1976 as application services rose from 25.5% in 1974 to 28.9% in 1976 and then to 34.2% in the first half of fiscal 1977, he told security analysts here recently.

Industry services' contribution to revenues has risen from 1.4% in 1974 to 7.8% in the first half of 1977, he added.

NCSS pruned its product line from over 150 to about 60 "so we could concentrate our resources and create real expertise in the problem areas these products address," Weissman explained.

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The firm "is no longer just a time-sharing company. We are a marketing service company specializing in business informa-" he observed.

NCSS plans to leverage its data management system's capabilities by using it to develop specific problem-solution packages to address well-defined markets, such as its human resources manage-

ment package, he said.
The firm has developed the capability of delivering a package of customer services which includes large computer expertise, sophisticated communications and applications software, he said.

Financial Picture Better

NCSS' financial picture has im-

proved. During 1976, compared with year-ago quarters, earnings grew 8%, shrank 2%, increased 30% and then rose another 39%.

The growth continued in the first quarter of fiscal 1977 with a 48% improvement.

With the market for information services estimated at \$2 billion in 1980, Weissman said "that's a sufficiently large market in which to compete.

Our success need not be tied to taking a significant piece of the marketplace away from IBM and we are comfortable that IBM is not going to take materially more than its current share of market — for political, economic, legal and organizational reasons,

Braegen Expecting Profitable '77; **Predicts Sales to Reach \$8 Million**

SAN FRANCISCO - Braegen Corp. expects to have its first profitable year next year thanks to the efforts of some dedicated ex-IBMers who believed in their product, according to Larry C. Edwards. vice-president marketing.

The firm, which makes the Virtual Terminal System, suffered a setback in 1975 when California Computer Products, Inc. (Calcomp) pulled out of a commitment to buy it.

But that's all over, Edwards said. Braegen has secured new capital from European backers and is alive and kicking with about 50 employees now.

Although 1976 sales were in the

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range of about \$2 million, Braegen expects to realize between \$6 million and \$8 million in sales during 1977, he said.

The product is what kept the firm alive, Edwards indicated. It is a minicomputer system with a family of associated peripheral devices that can act as a remote computer in a subserviant, position to a host, in place of an IBM 3270, as a remote job entry system, as a data entry system or as a local job entry system in lieu of an IBM 1403, he said.

The system is firmly based on the concept of centralized DP equipment. But the user now wants to do some processing on data before barding processing on data before handing it to the host, Edwards said.

The system differs from IBM's 3270 in that IBM offers a number of applications which stand alone in a partition and the user must decide which terminal to use for a specific application.

"We allow users with one terminal to go into each one of the partitions," Edwards noted; with multiple interfaces, users can switch between partitions.

The firm competes with all 3270-compatible manufacturers as well as Four Phase, Kaytheon, Data 100 and, in some instances. mini makers such as Digital Equipment Corp. and Data

General Corp., he added. Braegen was founded in 1973 by a group of ex-IBMers and shortly began to seek an OEM arrangement to supply the product and allow someone else to market it.

That someone was Calcomp, which signed an agreement to buy the firm and market the system in August 1974.

Braegen geared up production, had a backlog of systems and brought in 60 salespeople and managers to be trained on the

Then, in August 1975, Calcomp said it would not proceed with the agreement.

At that point Braegen had 250 employees and was shipping eight systems a month.

During the time between the layoffs and Braegen's rebirth, the system was enhanced and some manufacturing costs were reduced. Braegen was lucky because at the time of the "disaster" the firm was in the position to manufacture the systems and de-velopment behind it, Edwards

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Requires degree in Chemical Engineering, Chemistry, Math or Statistics with experience in process simulation, mathematical modeling and statistical applications. The person we seek will have at least 3 years of industrial Fortran programming experience and a strong ability to communicate and get along with others. Salary commensurate with experience. Interested applicants should send resume iricluding salary history and requirements to:

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Will direct the design and implementation of specific interactive graphics applications. Must be knowledgeable in Fortran and Assembly language, and experienced on one or more existing graphics systems. Some prior project leader experience desirable. Knowledge of mapping and 2D/3D drafting is a plus.

Job location will be in corporate headquarters in sunny, warm Anaheim, Calif. Numerous fringe benefits including a dental plan and a liberal relocation policy.

For further details, please send a copy of your resume and specific salary history to:

> Don Modie 3190 Mira Loma, Anaheim, Ca. 92806

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Large scale MIS...distributive processing...telecommunications...IMS Data Base...VSAM...interactive systems...Borden's Corporate Data Center is literally charged with challenge for experienced data processing specialists. Working in a multiple 370/158 hardware environment, you will have hands-on opportunity to make contributions across the full spectrum of DP...join us.

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- Opportunity to work with:

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Principal Duties:

- Design, develop and install data communication systems in a state of the art (systems network architecture) environment.
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- software
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 of data communications technology to the solution of
 business problems
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 Data communications performance measurement

- equirements:

 3 to 5 years experience as a systems programmer in a VS/1 or VS/2 environment
 Experience in the design and development of data communications systems with exposure to the concepts and application of data communications as applied to IBM 370 systems
 Thorough knowledge of Assembler Language and Job Control Language for an IBM environment
 Oriented toward solution of problems using a project planning approach

Sr. Software Specialist - OS/VS1

- Principal Duties:
 Generate, install and maintain IBM OS/VS1 system control
 Evaluate and select utility software for corporate wide data processing
 Performance measurement for SCP

Requirements:

- Requirements:

 3-5 years experience as a systems programmer in a VS/1 or VS/2 environment

 Formal training in IBM OS/VS1 intervals or equivalent

 Thorough knowledge of Assembler Language

 Experience in working with VSAM and SMP

Sr. Software Analyst - IMS/VS

- incipal Duties: Generate, install and maintain latest IMS software Evaluate and select IMS/VS utilities IMS/VS performance measurement

Requirements: 3.5 years as a systems programmer in a VS/1 or VS/2

- environment
 Formal training in IBM classes for IMS/VS systems
- programming or equivalent
 Thorough knowledge of Assembler Language.
 OS/VS 1 internals training helpful, but not required.
 GIS/VS training beneficial

The salaries are excellent and directly reflect the responsibility level of your starting assignment. For prompt consideration, please send your detailed resume to: Professional Employment, Dept. 3994.

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OPERATING SYSTEMS

Systems programmer with at least 5 years ex-perience and in-depth knowledge of MVT, OS/VS, and VM. Experience with ASP highly de-

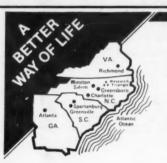
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Senior level systems programmer with experi-ence in teleprocessing. TCAM knowledge desire-able. Our TP Monitor is In-

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Enjoy all the advantages of the progressive Southeast. This area offers a temporate climate with a reasonable cost of living, excellent shopping, fine schools, abundant, reasonably priced housing as well as yearround golf & tennis, college & professional sports, top flight cultural & entertainment opportunities, plus easy access to mountain, lake & beach resort areas.

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PL1; or Assembler. Light syst
design exp. OS-JCL a plus.
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OPPORTUNITIES

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To \$35,000

Leading Midwest based insurance company seeking an EDP profes-sional with a depth of experience in insurance systems management to direct the company's data base function. Data base expertise is desired, but related sophisticated on-line systems development experience would be considered. Send resume including salary history to:

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DIRECTOR OF COLLEGE COMPUTER CENTER

The State University College at Oneonta, N.Y. is seeking a Computer Center Director preferably with both management and academic experience. The individual selected will be responsible for overseeing the design and development of administrative, instructional, and research applications, employing COBOL and FORTRAN IV on a Burroughs B-4700 system.

TRAN IV on a Burroughs B-4700 system. Applicants should have a Ph.D. with administrative experience. Salary up to \$23,800, depending on experience and ability. Oneonta is one of the several colleges of arts and science in the State University of New York System. It is located 200 miles north-west of New York City with a student enrollment of approximately 6000. Fringe benefits up to 32% of salary. The college is an Affirmative Action/Equal Opportunity Employer. Closing date for applications: February 15, 1977. Please reply to:

Robert S. Morrissey

to: Robert S. Morrissey
Chairman of Selection Committee
Ad. 135
State University College
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PROGRAMMING

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Qualified candidates will possess a degree in Computer Science or related field and extensive experience in all aspects of control system programming including MVT/HASP and online systems. MVS experience helpful. Supervisory experience of a minimum of 5 system programmers required.

Send resume establishing qualifications, full employment and earnings history, and salary requirements to Kenneth R. Logan.

The Rand Corporation 1700 Main Street Santa Monica, CA 90406 An Affirmative Action Employer

We invite applications for CORDINATOR OF EDUCATIONAL COMPUTER SERVICES involving coordination of academic computer usage, writing user manuals, organizing seminars, and consulting with faculty. All qualified candidates will be considered with preference to Masters degrees in Computer Science and experience on the Burroughs 6700 system. Yearly salary is \$13,000 to \$16,000 depending upon qualifications.

Send vitae and five reference names to: Dr. R.W. Pulleyblank, Search Committee, A.V.P. Office, University of the Pacific, Stockton, CA 95211. The University is an equal opportunity/affirmative action employer. Deadline, February 15, 1977.

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- pervisory experience

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Programmers - 2-4 years experience in COBOL and OS JCL. Should be familiar with data base systems. Background should include exposure in Fortran, BAL, Graphics, and IMS. Construction or manufacturing industry background desirable.

Systems Analysts - 3-5 years experience in analysis and design of systems utilizing data base concepts. Familiarity with COBOL, Fortran, Graphics, Inventory Control and Records Management desirable

These positions offer a competitive salary and fringe benefit package. Qualified candidates should submit a complete resume including salary history and requirements to:

> W.B. GAY **Personnel Administrator**



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Our large computer group has an excellent opportunity for a Systems Programmer to be involved in providing software support to a user base on time-sharing production systems. You'll assist in monitoring and optimizing both hardware and software throughput. Ideally, you will not only have technical ability but also will be able to interface with Digital's internal management in helping them to project future-in-house equipment needs.

This position requires a BS or equivalent knowledge of operating systems theory, and 2-3 years programming ex-perience in assembly or higher level languages, such as COBOL, is preferred.

Forward resume outlining salary requirements to Douglas B. D'Agata, Digital Equipment Corporation, 200 Forest Street, Marlboro, Massachusetts 01752.

digital equipment corporation

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PROGRAMMER ANALYST STATE UNIVERSITY OF NEW YORK AT ALBANY COMPUTING CENTER

Seeks Programmer/Analysts to design and implement computer-based administrative support systems in a data base management environment.

QUALIFICATIONS: Degree; three years' experience pro-gramming business or university application. Special consider-ation to those who have: experience in college EDP; systems analyst experience; advanced academic degrees.

SALARY RANGE: \$12,800 - \$18,900. Excellent fringe

Send resumes, references, salary history to:

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Computing Center
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APPLICATIONS PROGRAMMER **ANALYSTS**

This is an opportunity for Programmer/Analysts with at least 1 year experience to become a part of a sophisti-cated large scale data processing environment which includes an Amdahl 470 and a Nationwide TP Network.

Your experience should include IBM 360 or 370 OS or VS, and competence in ANS COBOL and JCL. A plus will be experience with ASP, Panvalet, TSO, BAL, on-line systems, and data base management systems.

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PROJECT MANAGER
POSITION - Data Processing Proj-

PROJECT MANAGER
POSITION - Data Processing Project Manager
LOCATION - Alameda County,
Oakland, CA, District Attorney's
Office
THE PROJECT - To convert an
existing staff management resource system from a Singer computer system and implement Automated Legal Research.
MINIMUM QUALIFICATIONS
Seven years DP experience in development and implementation of
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SALARY - Commensurate with
experience to \$23,500. Outstanding fringe benefit package.
APPLICATION PROCESS - Send
updated resume to Alameda
County Personnel Dept., c/o John
Enos, 1221 Oak St., Rm. 220,
Oakland, CA 94612. Applicants
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(1) Project Management experience
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(2) Text Storage and Retrieval (2) Text Storage and experience experience (3) On-line systems experience (4) Computer-to-Computer conversions experience (5) Systems Analysis & Design experience (6) Legal or criminal justice systems experience systems experience (PPLY BY - January 31, 1977

APPLY BY - January 31, 1977

Individuals with a Ph.D. in Computer Science are invited to apply for an Assistant Professor or an Associate Professor appointment beginning in September, 1977. Consideration for a tenure track appointment will be given. Applicants for the position should submit, in addition to a resume and list of five professional references, evidence of successful teaching experience and evidence of the ability to provide positive professional impetus to the Computer Science program of the University. Applications are particularly encouraged from individuals with experience in the areas of computer retworks, telecommunications, file management, and/or computer graphics. Applications must be received by February 15, 1977. Affirmative Action, Equal Opportunity, Title IX Employer. Apply California Polytechnic State University, D.F. Stubbs, Computer Science & Statistics, San Luis Obispo, Ca. 93407.

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Mr. E.J. Podeszwa Personnel Officer
West Virginia University Morgantown, WV 26506
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This position is at our corporate offices in Minneapolis. Starting salary based on applicable experience. Excellent fringe benefits including air travel. Send detailed resume or call (612) 726-7668.
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ASSISTANT **DATA PROCESSING** MANAGER/ **ON-LINE SYSTEM**

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Requires on-line experience for systems development in Assembler language, maintenance, program testing, and the Installation of CDC and PDP equipment.

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Operations Production Technical Support Requires 1-2 years experience in coding and debugging IBM 360/370 OS JCL, analysis and resolution of production abends, OS utilities, operations documentation review and turnover. Knowledge of MVS, TSO and hands-on computer operations helpful.

Systems Programmer

puter operations neight.

Systems Programmer

Requires experience in such areas as: MVS, JES

II, TSO/TCAM, VTAM/NCP, VSAM, IMS, and
multiple languages, including ALC, COBOL,
FORTRAN OR MARK IV. Must possess ability
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interpret performance data, recommend and
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e offer excellent salaries, benefits, and growth
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Candidates should have 2-3 years experience in IMS Systems Programing on complex on-line logical data bases. Experience with Message Format Services and IBM performance tuning aids is desirable.

SYSTEMS PROGRAMMER

This position requires a minimum of two years software programming experience on large scale IBM 370 installations running OS/MVT and HASP. Individual should be strong in ALC, COBOL and telecommunications. Conversion experience from OS to VS systems is an extra.

We offer a full benefit package, excellent growth potential and salary commensurate with experience. Submit resume with salary history in confidence to:

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Software Systems

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A minimum of 3 years' CICS experience including systems generation and extensive problem analysis is required. STAIRS implementation and 3705 software experience is desired.

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San Francisco Bay Area

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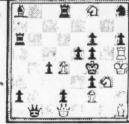
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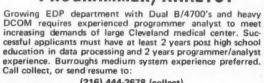
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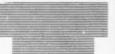
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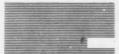
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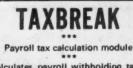


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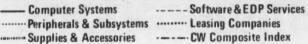
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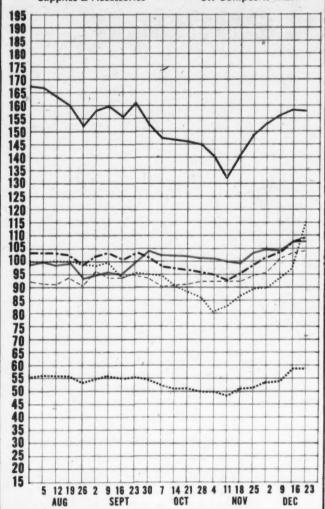
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|----------|------|------------------|-----------|
| | | 1976 | 1975 |
| Shr Ernd | | \$.63 | " a.4 |
| Revenue | | 61,879,000 | 34,669,00 |
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| 9 Mo Shr | | 1.62 | a1.1 |
| Revenue | | 157,987,000 | 98;535,00 |
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| | 1976 | 1975 |
|----------|------------|-----------|
| Shr Ernd | \$.32 | \$.2 |
| Revenue | 7,083,000 | 8,589,00 |
| Earnings | 278,000 | 208,00 |
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| Revenue | 13,864,000 | 16,362,00 |
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|----------|--------------------|------------|
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| Earnings | 672,299 | (1,341,316 |
| 6 Mo Shr | .66 | |
| Revenue | 16,978,952 | 15,427,69 |
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| Earnings | 1,298,643 | (1,122,072 |

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|-----------|-----------------|-------------|
| | 1976 | a1975 |
| Shr Ernd | \$1.59 | |
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| Spec Cred | b1,131,000 | d(5,263,00 |
| Earnings | 13,569,000 | (13,780,00 |
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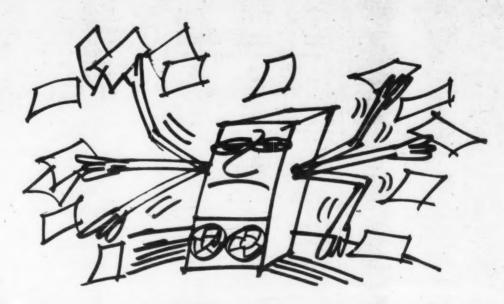
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|--|-----|-------------------|-----------|--------|-------|-------|--|--|--|
| COMPUTER SYSTEMS COMPUTER SYSTEMS COMPUTER SYSTEMS COMPUTER SYSTEMS COMPUTER SYSTEMS COMPUTER SYSTEMS COMPUTER AUTOMATION 10-19 18 3/4 +1 3/4 + | | | PRICE | | | | | | |
| COMPUTER SYSTEMS COMPUTER SYSTEMS D AMDAHL CORP 23-39 39 42 3/4 47. N PURROUGHS CORP 84-108 88 1/2 +1 1/8 +1. O COMPUTER AUTOMATION 10-19 18 3/4 +1 1/8 +1. O CONTROL OATA CORP 18-27 25 1/4 -1/8 -1. N OATA GENERAL CORP 40-60 42 3/4 -3/4 -1 O DATAPOINT CORP 24-46 28 1/2 0 0 0. O DIGITAL COUPLERN 14-66 0 53 1/4 +1/4 +4. N DIGITAL EQUIPAENT 46-60 53 1/4 +1/4 +4. N DIGITAL EQUIPAENT 46-60 53 1/4 +1/4 +0. N ELECTRONIC ASSOC. 2-5 2 1/4 0 0. N ELECTRONIC ENGINEER. 7-16 8 -1/5/8 -9. N FOXBORD 28-51 49 -7/8 -1. O GENERAL AUTOMATION 4-11 8 1/8 +1 1/8 +1 1/8 -1. O GEN COMPUTER CORP 1-1 1/2 0 0. N HEMLETT-PACKAND CO 80-117 83 7/8 -2 7/8 -1. O GENERAL AUTOMATION 4-11 8 1/8 +1 1/8 -1. O GEN COMPUTER CORP 1-1 1/2 0 0. N HEMLETT-PACKAND CO 80-117 83 7/8 -2 7/8 -2. N HONEYWELL INC 34-56 46 -1/8 -0. N HEMDREX 17-33 23 3/8 -3/8 -1/8 -1. O MODULAR COMPUTER SYS 1-9 7 1/2 -1/8 -1. O MEMOREX 17-33 23 3/8 -3/8 -1/8 -1. O MODULAR COMPUTER SYS 3-14 4 7/8 -3/8 -7. N NCR. 24-37 35 1/2 -5/8 -1. O PRIME COMPUTER INC 4-18 16 3/4 -1/2 -5/8 -1. O PRIME COMPUTER INC 4-18 16 3/4 -1/2 -5/8 -1. O SYCOR INC 9-31 12 1/4 -3/4 -5/8 -1. O SYCOR INC 9-31 12 1/4 -3/4 -6/8 -1/8 -7. A SYSTEMS ENG. LABS 5-10 6 0 0. N OWNER INC 1-1 1 3/4 -1/8 -1/8 -2. A GOMPUTER INVSIPS GRP 1-3 1/8 -2 7/8 -6. O COMPUTER INVSIPS GRP 1-3 1/4 -2 3/8 -2. LEASING COMPANIES D BOCTHE COMPUTER CORP 1-8 7 5/8 1/4 -3/4 -3/8 -3/8 -1/8 -1/2 -7/8 -6. O COMPUTER INVSIPS GRP 1-3 1 1/2 -3/8 -20. A HICKED CORP 0-1 1/4 -2. A DCL INC 1-1 1/4 -2. A DCL INC 1-1 1/4 -2. A DCL INC 1-1 1/4 -3/4 -1/2 -7/8 -6. O PICKEET FEX CORP 0-1 1/8 0 0 0. A PICKEET FEX CORP 0-1 1/8 0 0 0. A PICKEET FEX CORP 0-1 1/8 0 0 0. A PICKEET FEX CORP 0-1 1/8 0 0 0. | | | | | | WEEK | | | |
| COMPUTER SYSTEMS O AMDAHL CORP | | | | | | PCT | | | |
| O AMDAHL CORP N - AURROUGHS CORP N - AURROUGHS CORP N - AURROUGHS CORP O COMPUTER AUTOMATION O CONTROL OATA CORP N - OATA GENERAL CORP O DATA GENERAL CORP O DATA GENERAL CORP O DATA GENERAL CORP O DATA GENERAL CORP O DIGITAL COMP CONTROL 2- 7 6 1/2 + 1/4 +0. N DIGITAL COMP CONTROL 2- 7 6 1/2 + 1/4 +0. N ELECTRONIC ASSOC. 2- 5 2 1/4 0 0 0. FURROUGHS SYSTEMS O FOUR-PHASE SYSTEMS O FOUR-PHASE SYSTEMS O FOUR-PHASE SYSTEMS O GENERAL AUTOMATION O MONEYWELL INC O MONEYWELL INC O MONEYWELL INC O MANAGEMENT ASSIST O MICRODATA CORP O MICRODATA CORP O MICRODATA CORP O MODULAR COMPUTER SYS O MICRODATA CORP O MODULAR COMPUTER SYS O MICRODATA CORP O MOREYWELL INC O MODULAR COMPUTER SYS O MICRODATA CORP O MODULAR COMPUTER SYS O MICRODATA CORP O MOREYWELL INC O MODULAR COMPUTER SYS O MICRODATA CORP O MODULAR COMPUTER SYS O MICRODATA SYSOCIATES O MICRODATA SYSORIA SYSORI | ** | | (1) | 14/6 | CHNGE | CHNGE | | | |
| O AMDAHL CORP N - AURROUGHS CORP N - AURROUGHS CORP N - AURROUGHS CORP O CCMPUTER AUTOMATION O CONTROL DATA CORP O DATA GENERAL CORP O COMPUTER CORP O CORPORATION O GENERAL AUTOMATION O GENERAL CORP O TIME O COMPUTER CORP O SA TIME O COMPUTER CORP O SA TIME O COMPUTER CORP O SYCOR INC O SYCOR IN | | | | | | | | | |
| O AMDAHL CORP N - AURROUGHS CORP N - AURROUGHS CORP N - AURROUGHS CORP O CCMPUTER AUTOMATION O CONTROL DATA CORP O DATA GENERAL CORP O COMPUTER CORP O CORPORATION O GENERAL AUTOMATION O GENERAL CORP O TIME O COMPUTER CORP O SA TIME O COMPUTER CORP O SA TIME O COMPUTER CORP O SYCOR INC O SYCOR IN | | | | | | | | | |
| O AMDAHL CORP N - AURROUGHS CORP N - AURROUGHS CORP N - AURROUGHS CORP O COMPUTER AUTOMATION O CONTROL OATA CORP N - OATA GENERAL CORP O DATA GENERAL CORP O DATA GENERAL CORP O DATA GENERAL CORP O DATA GENERAL CORP O DIGITAL COMP CONTROL 2- 7 6 1/2 + 1/4 +0. N DIGITAL COMP CONTROL 2- 7 6 1/2 + 1/4 +0. N ELECTRONIC ASSOC. 2- 5 2 1/4 0 0 0. FURROUGHS SYSTEMS O FOUR-PHASE SYSTEMS O FOUR-PHASE SYSTEMS O FOUR-PHASE SYSTEMS O GENERAL AUTOMATION O MONEYWELL INC O MONEYWELL INC O MONEYWELL INC O MANAGEMENT ASSIST O MICRODATA CORP O MICRODATA CORP O MICRODATA CORP O MODULAR COMPUTER SYS O MICRODATA CORP O MODULAR COMPUTER SYS O MICRODATA CORP O MOREYWELL INC O MODULAR COMPUTER SYS O MICRODATA CORP O MODULAR COMPUTER SYS O MICRODATA CORP O MOREYWELL INC O MODULAR COMPUTER SYS O MICRODATA CORP O MODULAR COMPUTER SYS O MICRODATA SYSOCIATES O MICRODATA SYSORIA SYSORI | | 601 | MOUTED CV | 2427 | | | | | |
| N - PURRETUGHS CORP O COMPUTER AUTOMATION CONTROL DATA CORP 10-19 18 3/4 +1 3/4 +10 N CONTROL DATA CORP O ATA GENERAL CORP O DATA GENERAL CORP O DATAPCINY CORP O TIGITAL COMPLERNT N DIGITAL COMPLERNT N DIGITAL EQUIPHENT N ELECTRONIC ENGINEER. FOUR-PHASE SYSTEMS FOUR-PHASE SYSTEMS O | | | | | | | | | |
| O CCMPUTER AUTOMATION 10-19 18 3/4 + 13/4 + 10. N CONTROL DATA CORP 18-27 25 1/4 - 1/8 -0. N OATA GENERAL CORP 40-60 42 3/4 - 3/4 -1. O DATAPOINT CORP 24-46 28 1/2 0 0. D TIGITAL COMP LONTROL 2- 7 6 1/2 + 1/4 +4. N DIGITAL COMP LONTROL 2- 7 6 1/2 + 1/4 +4. N DIGITAL COMP LONTROL 2- 7 6 1/2 + 1/4 +4. N DIGITAL COMP LONTROL 2- 7 6 1/2 + 1/4 +4. N DIGITAL COMP LONTROL 2- 7 6 1/2 + 1/4 +4. N DIGITAL COMP LONTROL 2- 7 6 1/2 + 1/4 +4. N DECTRONIC ASSOC. 2- 5 2 1/4 0 0. A ELECTRONIC ENGINEER. 7-16 8 - 1/4 -3. FOUR-PMASE SYSTEMS 13-21 14 3/4 - 15/8 -9. N FOXBORO 28-51 49 - 7/8 -1. O GENERAL AUTOMATION 4-11 8 1/8 + 1 1/8 +1. O GEN COMPUTER CORP 1-1 1 1/2 0 0. N HONEYWELL INC 34-56 46 1/8 -2 7/8 -3. N HONEYWELL INC 34-56 46 1/8 -2 7/8 -3. N HONEYWELL INC 34-56 46 1/8 -0. N MORDULAR COMPUTER SYS 1-19 7 1/2 - 1/8 -1. O MODULAR COMPUTER SYS 3-14 4 7/8 - 3/8 -1. D MODULAR COMPUTER SYS 3-14 4 7/8 - 3/8 -1. N NCR. 24-37 35 1/2 - 5/8 -1. D PRIME COMPUTER INC 4-18 16 3/4 - 1/2 - 5/8 -1. N RAYTHEON CO 45-57 59 5/8 -1 1/2 - 5/8 -1. N RAYTHEON CO 45-57 59 5/8 -1 1/2 - 5/8 -1. N RAYTHEON CO 45-57 59 5/8 -1 1/2 - 5/8 -1. N SYSTEMS ENG. LARS 5-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 - 1/8 -0. N VARIAN ASSOCIATES 12-17 13 7/8 - 1/8 -0. COMMERCE GROUP CORP 2-3 1 5/8 -1/8 -7. COMPUTER INVSIRS GRP 1-3 1 1/2 - 3/8 -20. DATEORITE CORP 1-8 7 5/8 1 1/8 -2 7/8 -0. COMPUTER INVSIRS GRP 1-3 1 1/2 - 3/8 -20. DATEORITE CORP 1-8 7 5/8 -1/8 -7. COMPUTER INVSIRS GRP 1-3 1 1/2 - 3/8 -20. DATEORITE CORP 1-8 1 1/8 -1/2 - 7/8 -0. DATEORITE CORP 1-8 1 1/8 -1/2 - 7/8 -0. DATEORITE CORP 1-8 1 1/8 -1/2 - 7/8 -0. DATEORITE CORP 1-8 1 1/8 -0. DATEORITE | | | | | | | | | |
| N CONTROL DATA CORP N OATA GENERAL CORP O ATA GENERAL CORP O A COMMERCE GROUP CORP C A GOMPUTER CORP O ATA GENERAL CORP O A COMMERCE GROUP CORP C A GOMPUTER INVSIES GRP O ATA GENERAL CORP O A COMMERCE GROUP CORP C A GOMPUTER INVSIES GRP O ATA GENERAL CORP O A COMMERCE GROUP CORP C A GOMPUTER INVSIES GRP O ATA GENERAL CORP O A COMMERCE GROUP CORP C A GOMPUTER INVSIES GRP O A TO A GOMPUTER CORP O A GOMPUTER CORP O A COMMERCE GROUP CORP C A GOMPUTER CORP O A COMPUTER C | | | | | | | | | |
| N OATA GENERAL CORP | | | | | | | | | |
| O DATAPCINT CORP O DIGITAL COMP CONTROL N ELECTRONIC ASSOC. 2- 5 2 1/4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | | | | | | | | |
| DIGITAL COMP LONTROL DIGITAL EQUIPHENT DIGITAL EQUIPHENT N FLECTRONIC ASSOC. ELECTRONIC ASSOC. ELECTRONIC ASSOC. ELECTRONIC ENGINEER. FOUR-PHASE SYSTEMS FORDRO GENERAL AUTOMATION OGENERAL AUTOMATION HELLETT-PACKARD CO MONEYWELL INC MANAGEMENT ASSIST MIGNORYMELL INC MANAGEMENT ASSIST MIGNORYMELL TO BOLD BOLD BOLD BOLD BOLD BOLD BOLD BOL | | | | | | | | | |
| N DIGITAL EQUIPAENT 46-60 53 1/4 + 1/4 +0. N ELECTRONIC ASSOC. 2-5 2 1/4 0 A ELECTRONIC ASSOC. 2-5 2 1/4 0 A ELECTRONIC ENGINEER. 7-16 8 - 1/4 -3. O FOUR-PHASE SYSTEMS 13-21 14 3/4 - 1.5/8 -9. N FOXABORO 28-51 49 - 7/8 -1. O GRISTAL AUTOMATION 4-11 8 1/8 +1 1/8 +16. O GRI COMPUTER CORP 1- 1 1/2 0 0. N HENLETT-PACKARD CO 80-117 83 7/8 -2 7/8 -3. N HONEYWELL INC 34-56 46 - 1/8 -0. N HONEYWELL INC 34-56 46 - 1/8 -0. N HONEYWELL INC 34-56 46 - 1/8 -0. N HONEYWELL OUT 34-56 - 1/8 -1. O MICRODATA CORP 10-28 17 5/8 + 3/4 +4. D MODULAR COMPUTER SYS 3-14 4 7/8 - 3/8 -7. N NCR 0-24-37 35 1/2 - 5/8 -1. O PRINE COMPUTER INC 4-18 16 3/4 - 1/2 -2. N PERKIN-ELMER 19-27 20 + 3/8 +1. N RAYTHEON CO 45-67 59 5/8 -1 1/2 -2. N SYFERY RAND 40-52 43 1/8 - 27/8 -6. O SYCOR INC 9-31 12 1/4 - 3/4 - 5/8 O SYCOR INC 3-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 -1/8 -6. O SYCOR INC 3-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 -1/8 -3/8 -2. LEASING COMPANIES D BOCTHE COMPUTER CORP 1-8 7 5/8 + 1/8 +1. O COMPUTER INVSIPS GRP 1-3 1 1/2 - 3/8 -20. D ATRONIC RENTAL 1-1 3/4 - 1/8 -16. O DOL INC 1-1 3/4 - 1/8 -16. O DOL INC 1-1 3/4 - 1/8 -16. O DOL INC 1-1 1/2 - 3/8 -20. N ITEL 6-15 12 -1 -7. N ITEL 73/8 -20. O ANG TNC 0-1 1/8 0 0-1/8 -1/8 -7. PICKETE TEX CORP 0-1 1/8 0 0-1/8 -1/8 -7. | | | | | | 0.0 | | | |
| N ELECTRONIC ASSOC. A ELECTRONIC ASSOC. A ELECTRONIC ENGINEER. A FORM-PHASE SYSTEMS A FOXADRO DENERAL AUTOMATION OGENERAL AUTOMAT | | | | | | | | | |
| A ELECTRONIC ENGINEER. 7- 16 8 -1/4 -3. A FOUR-PHASE SYSTEMS 13- 21 14 3/4 -15 5/8 -9. N FOXOROR 28- 51 49 -7/8 -1. O GENERAL AUTOMATION 4- 11 8 1/8 +1 1/8 +1. O GRI COMPUTER CORP 1- 1 1/2 0 0. N HONEYWELL INC 34- 56 46 -2 7/8 -2. N HONEYWELL INC 34- 56 46 -1/8 -0. N HONEYWELL INC 34- 56 46 -1/8 -0. N HONEYWELL INC 34- 56 46 -1/8 -0. MANAGEMENT ASSIST 1- 9 7 1/2 -1/8 -1. O MANAGEMENT ASSIST 1- 9 7 1/2 -1/8 -1. O MODULAR COMPUTER SYS 3- 14 4 7/8 -3/8 -1. O MODULAR COMPUTER SYS 3- 14 4 7/8 -3/8 -1. O MODULAR COMPUTER SYS 3- 14 4 7/8 -3/8 -1. O PRIME COMPUTER INC 4- 18 16 3/4 - 1/2 -5/8 -1. PRIME COMPUTER INC 4- 18 16 3/4 - 1/2 -5/8 -1. N NCR. 24- 37 35 1/2 -5/8 -1. O PRIME COMPUTER SYS 3- 14 4 7/8 -3/8 -7. N NCR. 24- 37 35 1/2 -5/8 -1. PRINE COMPUTER INC 4- 18 16 3/4 - 1/2 -5/8 -1. N RAYTHEON CO 45- 67 59 5/8 -1 1/2 -5/8 -1. N RAYTHEON CO 45- 67 59 5/8 -1 1/2 -5/8 -1. N SYSTEMS ENG. LABS 5- 10 6 0 0. SYCOR INC 9- 31 12 1/4 -3/4 -5. A WARIAN ASSOCIATES 12- 17 13 7/8 -1/8 -0. A HANG LABS. 11- 20 14 -3/8 -2. LEASING COMPANIES O BOCTHE COMPUTER CORP 1- 8 7 5/8 + 1/8 +1. A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -7. A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -1/8 -7. A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -1/8 -1. A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -1/8 -1. A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -1/8 -1. A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -1/8 -1. A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1 | | DIGITAL EQUIPMENT | | | | | | | |
| O FOUR-PHASE SYSTEMS O FOURPOND O GRISTAN AUTOMATION O GRICOMPUTER CORP N HEMLETT-PACKARD CO MICRODATA CORP MICRODATA CORP MICRODATA CORP O MONULAR COMPUTER SYS N NCR O PRIME COMPUTER INC O PRIME COMPUTER INC N PERKIN-ELHER O PRIME COMPUTER INC N SYCRI INC N SYCRI INC N SYSTEMS ENG. LABS O YARIAN ASSOCIATES I D SYCOR INC O COMDISCO INC O COMPUTER INC SYS I D SYCOR INC O SYCOR INC O SYCOR INC O SYCOR INC O COMPUTER SYS I D SYCOR INC O I SYCOR INC O | | ELECTRONIC ASSOC. | | | | 0.0 | | | |
| N FOXBORO O GENERAL AUTOMATION A - 11 O GENERAL AUTOMATION A - 11 O SENERAL AUTOMATION | | | | | - 1/4 | | | | |
| G GENERAL AUTOMATION 4-11 8 1/8 +1 1/8 +16. O GRI COMPUTER CORP 1- 1 1/2 0 0. N HENLETT-PACKARD CO 80-117 83 7/8 -2 7/8 -3. N HONEYWELL INC 34-56 46 -1/8 -0. N 18M 227-28B 270 1/4 +1 1/2 +0. O MANAGEMENT ASSIST 1- 9 7 1/2 -1/8 -1. O MEMOREX 17-33 23 3/8 -3/8 -1. O MICRODATA CORP 10-28 17 5/8 + 3/4 +4. O MODULAR COMPUTER SYS 3-14 4 7/8 -3/8 -7. N NCR 24-37 35 1/2 -5/8 -1. O PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. N PERKIN-ELMER 19-27 20 + 3/8 +1. N RAYTHEON CO 45-67 59 5/8 -1 1/2 -2. N SPERRY RAND 40-52 43 1/8 -2 7/8 -6. O SYCOR INC 9-31 12 1/4 - 3/4 -5/8 -1. A SYSTEMS ENG. LABS 5-10 6 0 0. SYCOR INC 9-31 12 1/4 - 3/4 -3/8 -3. LEASING COMPANIES LEASING COMPANIES LEASING COMPANIES D BOCTHE COMPUTER CORP 1- 8 7 5/8 + 1/8 -1/8 -2. A MANG LABS. 11- 20 14 - 3/8 -2. LEASING COMPANIES D BOCTHE COMPUTER CORP 2- 3 1 5/8 -1/8 -7. A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -1/8 -7. A COMMERCE GROUP CORP 2- 3 1 1/2 - 3/8 -20. D DATRONIC RENTAL 1- 1 3/4 - 1/8 -16. D DOLI INC 1- 1 3/4 - 1/8 -16. D DATRONIC RENTAL 1- 1 3/4 - 1/8 -16. N OPF INC 5- 8 6 5/8 - 1/2 -7. N ITEL 6-20 16 -3/8 -2. LEASPAC CORP 0- 1 1/8 0 -3/8 -2. D LEASPAC CORP 0- 1 1/8 0 0 0. PICKET STREET EX CORP 6- 9 7 3/8 -1/8 -7. | | | | | | -9.9 | | | |
| O GRI COMPUTER CORP 1- 1 1/2 0 0. N HENLETT-PACKAND CO 80-117 83 7/8 -2 7/8 -3. N HONEYWELL INC 34-56 46 - 1/8 -0. N 18M 227-288 270 1/4 +1 1/2 +0. N MANAGEMENT ASSIST 1- 9 7 1/2 - 1/8 -1. O MANAGEMENT ASSIST 1- 9 7 1/2 - 1/8 -1. O MODULAR COMPUTER SYS 3- 14 4 7/8 - 3/8 -1. O MODULAR COMPUTER SYS 3- 14 4 7/8 - 3/8 -1. O PRIME COMPUTER INC 4- 18 16 3/4 - 1/2 - 5/8 -1. PRINE COMPUTER INC 4- 18 16 3/4 - 1/2 - 5/8 -1. N RAYTHEON CO 45- 67 59 5/8 -1 1/2 - 5/8 -1. N RAYTHEON CO 9- 31 12 1/4 - 3/4 - 5. N SPERRY RAND 40- 52 43 1/8 -2 7/8 -6. O SYCOR INC 9- 31 12 1/4 - 3/4 - 5. SYSTEMS ENG. LABS 5- 10 6 0 0. N VARIAN ASSOCIATES 12- 17 13 7/8 - 1/8 -0. N HONEY COMPUTER CORP 1- 8 7 5/8 + 1/8 -0. ANG LABS. 11- 20 14 - 3/8 -2. LEASING COMPANIES O BOCTHE COMPUTER CORP 1- 8 7 5/8 - 1/8 -7. A COMPUTER INVSTRS GRP 1- 3 1 1/2 - 3/8 -20. D ATRONIC RENTAL 1- 8 1 1/8 + 1/8 +1.2 A OCL INC 1- 1 3/4 - 1/8 -10. N OPF INC 5- 8 65/8 - 1/2 - 7. N ITEL 6- 15 12 - 1 N ITEL 6- 17 - 7. N ITEL 6- 20 18 - 3/8 -2. D LEASPAC CORP 0- 1 1/2 3/8 -30. N NGR TNC 0- 1 1/8 0 0- 1/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 | | | | | | -1.7 | | | |
| N HENLETT-PACKARD CO 80-117 83 7/8 -2 7/8 -3. N HONEYWELL INC 34-56 46 -1/8 -0. N 184 227-288 270 1/4 +1 1/2 +0. O MANAGEMENT ASSIST 1-9 7 1/2 -1/8 -1. O MICRODATA CORP 10-28 17 5/8 -3/8 -1. O MICRODATA CORP 10-28 17 5/8 +3/4 +4. O MODULAR COMPUTER SYS 3-14 4 7/8 -3/8 -7. O PRIME COMPUTER INC 4-18 16 3/4 -1/2 -2. N PERKIN-ELMER 19-27 20 +3/8 +1. N RAYTHEON CO 45-67 59 5/8 -1 1/2 -2. N SPERRY RAND 40-52 43 1/8 -2 7/8 -6. O SYCOR INC 3 SYSTEMS ENG. LABS 5-10 6 0 0. SYCOR INC 3 SYSTEMS ENG. LABS 5-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 -1/8 -3/8 -2. DEASING COMPANIES LEASING COMPANIES LEASING COMPANIES LEASING COMPANIES LEASING COMPANIES LEASING COMPANIES DATRONIC RENTAL 1-8 7 5/8 +1/8 +1. O COMPUTER INVSIPS GRP 1-3 1 1/2 -3/8 -20. D ATRONIC RENTAL 1-1 3/4 -1/8 -16. D ATRONIC RENTAL 1-1 3/4 -1/8 -10. D | | | | | | +16.0 | | | |
| N HONEYWELL INC 34-56 46 - 1/8 -0. N 18H 227-288 270 1/4 +1 1/2 +0. O MANAGEMENT ASSIST 1- 9 7 1/2 - 1/8 -1. O MEMOREX 17-33 23 3/8 - 3/8 -1. O MICRODATA CORP 10- 28 17 5/8 - 3/8 -1. O MODULAR COMPUTER SYS 3- 14 4 7/8 - 3/8 -7. N NCR. 24-37 35 1/2 - 5/8 -1. O PRIME COMPUTER INC 4- 18 16 3/4 - 1/2 - 5/8 -1. N PERKIN-ELMER 19- 27 20 + 3/8 +1. N RAYTHEON CO 45- 67 59 5/8 -1 1/2 - 7/8 -6. O SYCOR INC 9- 31 12 1/4 - 3/4 -5/8 A SYSTEMS ENG. LABS 5- 10 6 0 N VARIAN ASSOCIATES 12- 17 13 7/8 - 1/8 -0. A LEASING COMPANIES LEASING COMPANIES D BOCTHE COMPUTER CORP 1- 8 7 5/8 + 1/8 -2. A COMMERCE GROUP CORP 2- 3 1 5/8 - 1/8 -2. A COMMERCE GROUP CORP 2- 3 1 5/8 - 1/8 -7. A COMPUTER INVSTRS GRP 1- 3 1 1/2 - 3/8 -20. A DATRONIC RENTAL 1- 8 1/8 1/9 -1/2 -7. A COMPUTER INVSTRS GRP 1- 3 1 1/2 - 3/8 -20. D DATRONIC RENTAL 1- 8 1 1/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/ | | | | | | 0.0 | | | |
| 18 | | | | | | -3.3 | | | |
| O MANAGEMENT ASSIST 1-9 7 1/2 -1/8 -1. O MEMOREX 17-33 23 3/8 -3/8 -1/8 -1. O MEMOREX 17-33 23 3/8 -3/8 -1/8 -1. O MICRODATA CORP 10-28 17 5/8 +3/4 +4. O MODULAR COMPUTER SYS 3-14 4 7/8 -3/8 -7. N NCR. 24-37 35 1/2 -5/8 -1. O PRIME COMPUTER INC 4-18 16 3/4 -1/2 -5/8 -1. O PRIME COMPUTER INC 4-18 16 3/4 -1/2 -5/8 -1. O PRIME COMPUTER INC 4-18 12 7 20 4 3/8 +1. N RAYTHEON CO 45-67 59 5/8 -1 1/2 -7/8 -6. O SYCOR INC 9-31 12 1/4 -2/4 -3/4 -5/8 -3/8 -1/8 -1/2 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 | | | | | | | | | |
| D MEMOREX O MICRODATA CORP O MODULAR COMPUTER SYS O PRIME COMPUTER INC O PRIME COMPUTER INC O PRIME COMPUTER INC O MODULAR INC O | | | | | | | | | |
| O MICRODATA CORP O MODULAR COMPUTER SYS 3-14 4 7/8 - 3/8 -7, N NCR. 24-37 35 1/2 - 5/8 -1.7 PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. N SPERRY RAND 40-52 43 1/8 -2 7/8 -6. SYCOR INC 9-31 12 1/4 - 3/4 -5/4 -3/4 -3/4 -3/4 -1/8 -1. A SYSTEMS ENG. LARS 5-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 - 1/8 -0. A HANG LABS. 11-20 14 - 3/8 -2. LEASING COMPANIES D BOCTHE COMPUTER CORP 1-8 7 5/8 + 1/8 +1. COMPUTER INVSTES GRP 1-3 1 1/2 - 3/8 -20. D ATRONIC RENTAL 1-1 3/4 - 1/8 -18. D DATRONIC RENTAL 1-1 3/4 - 1/8 -18. N DPF INC 5-8 6 5/8 - 1/2 -7. N ITEL 6-15 12 -1 -7. N ITEL 6-15 12 -1 -7. N ITEL 6-20 18 -3/8 -20. D LEASPAC CORP 0-1 1/8 3/8 -30. N NG TNC 0-1 1/8 0 0-1/8 -1/8 -1. | | | | | | | | | |
| O MODULAR COMPUTER SYS 3-14 4 7/8 - 3/8 -7. N NCR. 24-37 35 1/2 - 5/8 -1. O PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. N PERRIN-ELMER 19-27 20 + 3/8 +1. N RAYTHEON CO 45-67 59 5/8 -1 1/2 -2. N SPFRRY RAND 40-52 43 1/8 -2 7/8 -6. O SYCOR INC 9-31 12 1/4 - 3/4 -5. A SYSTEMS ENG. LABS 5-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 - 1/8 -0. A HANG LABS. 11-20 14 - 3/8 -2. LEASING COMPANIES O BOCTHE COMPUTER CORP 1-8 7 5/8 + 1/8 +1. COMPUTER INVSTRS GRP 1-3 1 1/2 - 3/8 -20. A COMMERCE GROUP CORP 2-3 1 5/6 - 1/4 -2. A COMMERCE GROUP CORP 1-8 1/8 -7. A COMMERCE GROUP CORP 1-8 1/8 -1/8 -7. A COMMERCE GROUP CORP 2-3 1 5/8 -1/8 -7. A COMPUTER INVSTRS GRP 1-3 1 1/2 -3/8 -20. DATRONIC RENTAL 1-1 3/4 -1/8 -16. N DPF INC 5-8 6 5/8 -1/2 -7. N ITEL 6-15 12 -1 -7. N LEASCO CORP 6-20 18 -3/8 -2. LEASPAC CORP 6-20 18 -3/8 -300. N NG TNC 9-1/8 -10. PINCER TEX CORP 6-9 7 3/8 -1/8 -1/8 -1. | | | | | | | | | |
| N NCR O PRIME COMPUTER INC 4-18 16 3/4 - 1/2 - 2/8 - 1/2 N PERKIN-ELMER 19-27 20 + 3/8 + 1/8 N RAYTHEON CD 45-67 59 5/8 - 1 1/2 - 2/ N SPERRY RAND 40-52 43 1/8 - 2 7/8 - 6/ O SYCOR INC 9-31 12 1/4 - 3/4 - 5/ SYSTEMS ENG. LABS 5-10 6 0 0 0 N VARIAN ASSOCIATES 12-17 13 7/8 - 1/8 - 0/ A WANG LABS. 11-20 14 - 3/8 - 2. LEASING COMPANIES D BOCTHE COMPUTER CORP 1-8 7 5/8 + 1/8 + 1/8 - 2 | 0 | MICRODATA CORP | 10- 28 | 17 5/8 | + 3/4 | +4.4 | | | |
| O PRIME COMPUTER INC 4-18 16 3/4 - 1/2 -2. N PERKIN-ELMER | | | | | | | | | |
| N PERKIN-ELMER 19-27 20 + 3/8 +1. N RAYTHEON CD 45-67 59 5/8 -1 1/2 -2. N SPERRY RAND 40-52 43 1/8 -2 7/8 -6. O SYCOR INC 9-31 12 1/4 - 3/4 -5. SYSTEMS ENG. LABS 5-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 -1/8 -0. A HANG LABS. 11-20 14 -3/8 -2. LEASING COMPANIES DEASING COMPANIES DEASING COMPANIES O BOCTHE COMPUTER CORP 1-8 7 5/8 + 1/8 +1. ST. ST. ST. ST. ST. ST. ST. ST. ST. ST | | | | | | | | | |
| N RAYTHEON CO 45-67 59 5/8 -1 1/2 -2. N SPERRY RAND 40-52 43 1/8 -2 7/8 -6. D SYCOR INC 9-31 12 1/4 -3/4 -5. A SYSTEMS ENG. LARS 5-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 -1/8 -0. A HANG LARS. 11-20 14 -3/8 -2. LEASING COMPANIES O ROCTHE COMPUTER CORP 1-8 7 5/8 + 1/8 +1. COMMERCE GROUP CORP 2-3 1 5/8 -1/8 -7. A COMMERCE GROUP CORP 2-3 1 5/8 -1/8 -7. A COMMUTER INVSTRS GRP 1-3 1 1/2 -3/8 -20. DATRONIC RENTAL 1-1 3/4 -1/8 -18. D DAT ROWING COMPANIES 1-8 1/8 -1/8 -12. D LEASENG CORP 6-10 18 -3/8 -2. N ITEL 6-15 12 -1 -7. N LEASENG CORP 6-20 18 -3/8 -2. LEASPAC CORP 6-1 1/8 0 0-1 1/8 0 0-1 1/8 -10. PICNEER TEX CORP 6-9 7 3/8 -1/8 -1. | | | | | | -2.8 | | | |
| N SPERRY GAND O SYCOR INC SYSTEMS ENG. LARS N VARIAN ASSOCIATES LEASING COMPANIES LEASING COMPANIES D SOCTHE COMPUTER CORP COMPOSCO INC COMPOSCO COMPOSCO INC COMPOSCO COMPOS | | PERKIN-ELMER . | | | | | | | |
| O SYCOR INC 9-31 12 1/4 -3/4 -5. A SYSTEMS ENG. LABS 5-10 6 0 0. N VARIAN ASSOCIATES 12-17 13 7/8 -1/8 -0. A MANG LABS. 11-20 14 -3/8 -2. LEASING COMPANIES O ROCTHE COMPUTER CORP 1-8 7 5/8 + 1/8 +1. COMPUTED INC 3-10 9 -1/4 -2. A COMMERCE GROUP CORP 2-3 1 5/8 -1/8 -7. A COMMERCE GROUP CORP 2-3 1 1/2 -3/8 -20. DATROWIC RENTAL 1-8 1 1/2 -3/8 -20. DATROWIC RENTAL 1-1 3/4 -1/8 -12. DOLI INC 1-1 3/4 -1/8 -12. N DPF INC 5-8 6 5/8 -1/2 -7. N ITEL 6-15 12 -1 -7. N LEASCO CORP 6-20 18 -3/8 -20. CLEASPAC CORP 0-1 1/2 3/8 +300. O NRG INC 0-1 1/8 0 0-1. PICNEER TEX CORP 6-9 7 3/8 -1/8 -1. | | | | | | -2.4 | | | |
| A SYSTEMS ENG. LARS 5-10 6 0 0 0. N. VARIAN ASSOCIATES 12-17 13 7/8 -1/8 -2. A WANG LARS. 11-20 14 -3/8 -2. EEASING COMPANIES DEASING COMPANIES 1-8 75/8 +1/8 +121/4 -221/4 -2221/4 -2221/2 -71/2 -71/2 -71/2 -71/2 -71/2 -71/2 -71/8 -161/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 -1/8 | | | | | | | | | |
| N VARIAN ASSOCIATES 12-17 13 7/8 - 1/8 -0. A MANG LABS. 12-17 13 7/8 - 1/8 -0. A MANG LABS. 11-20 14 -3/8 -2. LEASING COMPANIES DECEMBER COMPUTER CORP 1-8 7 5/8 + 1/8 +1. O COMPUTER CORP 1-8 7 5/8 - 1/8 -7. A COMMERCE GROUP CORP 2-3 1 5/8 - 1/8 -7. A COMPUTER INVSTRS GRP 1-3 1 1/2 - 3/8 -20. DATRONIC RENTAL 1-8 1 1/8 +1/8 +1/2 - 1/8 - 1/8 - 1/8 -1/8 - | | | | | | -5.7 | | | |
| LEASING COMPANIES DEASING COMPA | | | | | | 0.0 | | | |
| LEASING COMPANIES 1 80CTHE COMPUTER CORP 1- 8 7 5/8 + 1/8 +1. 1 COMDISCO INC 3- 10 9 - 1/4 -2. A COMMERCE GROUP CORP 2- 3 1 5/8 - 1/8 -7. A COMPUTER INVSTRS GRP 1- 3 1 1/2 - 3/8 -20. M DATRONIC RENTAL 1- 8 1 1/8 + 1/8 +12. A DCL INC 1- 1 3/4 - 1/8 -18. N DPF INC 5- 8 6 5/8 - 1/2 -7. N ITEL 6- 15 12 -1 -7. N ITEL 6- 15 12 -1 -7. N LEASCO CORP 6- 20 18 - 3/8 +30. O NRG INC 0- 1 1/8 0 0. A PICNEER TEX CORP 6- 9 7 3/8 - 1/8 -1. | | | | | | | | | |
| SOCTHE COMPUTER CORP 1- 8 7 5/8 + 1/8 +1.8 +1.9 COMDISCO INC 3- 10 9 - 1/4 -2.8 A COMMERCE GROUP CORP 2- 3 1 5/8 -1/8 -7.0 A COMMERCE GROUP CORP 1- 3 1 1/2 -3/8 -20.0 M DATRONIC RENTAL 1- 8 1 1/8 + 1/8 +12.0 A DCL INC 1- 1 3/4 -1/8 +18.0 DPF INC 5- 8 6 5/8 -1/2 -7.0 N ITEL 6- 15 12 -1 -7.0 LEASPAC CORP 6- 20 18 -3/8 -2.0 LEASPAC CORP 0- 1 1/2 4 3/8 +300.0 N ING INC 0- 1 1/8 0 0.0 PICNEER YEX CORP 6- 9 7 3/8 -1/8 -1.0 -1/8 -1/8 -1.0 -1.0 COMMERCE GROUP 1- 1/8 0 0.0 COMMERCE GROUP 1- 1/8 0.0 COMMERCE GROUP | A | WANG LABS. | 11- 20 | 14 | - 3/8 | -2.6 | | | |
| COMPISCO INC 3-10 9 -1/4 -2- | | LEAS | ING COMPA | NIES | | | | | |
| A COMMERCE GROUP CORP 2- 3 1 5/8 - 1/8 -7. A COMMERCE GROUP CORP 1- 3 1 1/2 - 3/8 -20. M DATRONIC RENTAL 1- 8 1 1/8 + 1/8 +1/2 A DCL INC 1- 1 3/4 - 1/8 -18. N DPF INC 5- 8 6 5/8 - 1/2 -7. N ITEL 6- 15 12 -1 -7. N LEASCO CORP 6- 20 18 - 3/8 +300. O NRG INC 0- 1 1/8 0 0. A PICNEER YEX CORP 6- 9 7 3/8 -1/8 -1. | | | | | | | | | |
| A COMPUTER INVSTRS GRP 1- 3 1 1/2 - 3/8 - 20. M DATRONIC RENTAL 1- 8 1 1/8 + 1/9 + 1/2. A DCL INC 1- 1 3/4 - 1/8 - 18. N OPF INC 5- 8 6 5/8 - 1/2 - 7. N ITEL 6- 15 12 - 1 - 7. N LEASON CORP 6- 20 18 - 3/8 - 20. O LEASPAC CORP 0- 1 1/2 + 3/8 + 300. O NRG INC 0- 1 1/8 0 0 0. A PICNEER TEX CORP 6- 9 7 3/8 - 1/8 - 1. | | | | | | -2.7 | | | |
| M DATRONIC RENTAL 1- 8 1 1/8 + 1/8 + 1/2 A DCL INC 1- 1 3/4 - 1/8 - 18 N OPF INC 5- 8 6 5/8 - 1/2 - 18 N ITEL 6- 15 12 -1 -1 - 7 N LEASCH CORP 6- 20 18 - 3/8 - 20 LEASPAC CORP 0- 1 1/2 + 3/8 + 300 NRG INC 0- 1 1/8 0 0 A PICNEER YEX CORP 6- 9 7 3/8 - 1/8 - 1 | 7.5 | | | | | -7.1 | | | |
| A DCL INC 1- 1 3/4 - 1/8 - 18. N DPF INC 5- 8 6 5/8 - 1/2 - 7. N ITEL 6- 15 12 - 1 - 7. N LEASCH CORP 6- 20 16 - 3/8 - 20. O NRG INC 0- 1 1/8 0 0. A PICNEER TEX CORP 6- 9 7 3/8 - 1/8 - 1. | | | | | | -50.0 | | | |
| N OPF INC 5- 8 6 5/8 - 1/2 -7. N ITEL 6- 15 12 -1 -7. N LEASCO CORP 6- 20 18 - 3/8 -2. O LEASPAC CORP 0- 1 1/2 + 3/8 +300. O NRG INC 0- 1 1/8 0 0. A PICNEER YEX CORP 6- 9 7 3/8 - 1/8 -1. | | | | | | +12.5 | | | |
| N ITEL 6- 15 12 -1 -7. N LEASCH CORP 6- 20 18 -3/8 -2. O LEASPAC CORP 0- 1 1/2 +3/8 +300. N NRG TNC 0- 1 1/8 0 0. A PICNEER TEX CORP 6- 9 7 3/8 -1/8 -1. | | | | | | -18.6 | | | |
| N LEASON CORP 6- 20 18 - 3/8 - 2. 0 LEASPAC CORP 0- 1 1/2 + 3/8 +300. 0 NRG INC 0- 1 1/8 0 0. A PICNEER TEX CORP 6- 9 7 3/8 - 1/8 - 1. | | | | | | -7.0 | | | |
| O LEASPAC CORP 0-1 1/2 + 3/8 +300. O NRG INC 0-1 1/8 0 0. A PICNEER TEX CORP 6-9 7 3/8 -1/8 -1. | | | | | | -7.6 | | | |
| O NRG INC O- 1 1/8 0 0. A PICNEER TEX CORP 6- 9 7 3/8 - 1/8 -1. | | | | | | -2.0 | | | |
| A PICNEER TEX CORP 6- 9 7 3/8 - 1/8 -1. | | | | | | | | | |
| | | | | | | 0.0 | | | |
| N U.S. LEASING 7- 12 10 1/4 + 1/8 +1. | | | | | | -1.6 | | | |
| | N | U.S. LEASING | 7- 12 | 10 1/4 | + 1/8 | +1.2 | | | |

| APOINT CORP 24- 46 28 1/2 0 0.0 0.0 0 COMPFILECTION SYSTMS 5- 9 5 1/2 0 0.0 0.0 171AL COMP CONTROL 27 7 6 1/2 + 1/4 44.0 0 0.0 0 COMPFILE TORK 2- 8 6 1/4 - 1/8 -1.9 0 COMPFILE TORK 2- 8 6 1/4 - 1/8 -1.9 0 COMPFILE TORK 2- 8 6 1/4 - 1/8 -1.9 0 COMPFILE NOTIONS 35 1- 2 1 1/4 0 0 0.0 | | | | | | | | | | | | | |
|--|-------------------|-----------|--------|------|--------|------|--------|-----------------------|--------|------|---------|-------|------|
| ANIL CORP | co | MPUTER SY | STEMS | | | | | | | | | | |
| REMIGHS CORP | | | | | | | | | | | | | |
| PUTER AUTOMATION 10-19 18 3/4 + 13/4 + 10-2 0 10 COLEMAN AMERICAN COS 2- 6 2 1/4 - 1/8 -5-5 2 | | | | | | | | | | | | | |
| TROIL DATA CORP 18- 27 25 1/4 -1/8 -0.6 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | |
| A GENERAL CORP | | | | | | | | | | | | | -5.2 |
| APOINT CORP 24- 46 28 1/2 0 0.0 0.0 0 COMPFILECTION SYSTMS 5- 9 5 1/2 0 0.0 0.0 171AL COMP CONTROL 27 7 6 1/2 + 1/4 44.0 0 0.0 0 COMPFILE TORK 2- 8 6 1/4 - 1/8 -1.9 0 COMPFILE TORK 2- 8 6 1/4 - 1/8 -1.9 0 COMPFILE TORK 2- 8 6 1/4 - 1/8 -1.9 0 COMPFILE NOTIONS 35 1- 2 1 1/4 0 0 0.0 | | | | | | | | | | | | + 1/2 | |
| TITAL COMP CONTENT. THAL GOURPHENT 6 -60 53 1/4 + 1/4 + 40.4 0 0 0.0 COMPUTER MOBIZIONS 1 - 2 1 1/4 0 0 0.0 COMPUTER NOBIZIONS 1 - 2 1 1/4 0 0 0.0 COMPUTER SCIENCES 4 8 7 0 0.0 COMPUTER MOBIZIONS 1 2 1/4 - 1/4 - 1/0 COMPUTER MOBIZIONS 1 2 1/4 - 1/4 - 1/0 COMPUTER MOBIZIONS 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | A GENERAL CORP | | | | | | 0 | COMPUTER DIMENSIONS | 3- | 7 | 6 7/8 | 0 | 0.0 |
| ITAL EQUIPAENT TOTANIC ASSOC. 2 5 2 1/4 0 0.0 CTRONIC ENGINEER. 7 - 16 8 | APCINT CORP | 24- 46 | 20 | 1/2 | 0 | 0.0 | 0 | COMP ELECTION SYSTMS | 5- | 9 | 5 1/2 | 0 | 0.0 |
| CTRONIC ASSOC. 2- 5 2 1/4 0 0 0.0 CRONGIERS 3- 8 7 0 0 0.0 CRONICE ROINEER. 7-16 8 7 1/4 -3.0 COMPUTER YASK GRUY 1- 2 1 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER YASK GRUY 1- 2 1/4 1/4 0 0.0 COMPUTER Y | ITAL COMP CONTROL | 2- 7 | 6 | 1/2 | + 1/4 | +4.0 | 0 | COMPUTER HORIZONS | 1- | 2 | 1 1/4 | 0 | 0.0 |
| CTRONIC ASSOC. 22 - 5 2 1/4 0 0 0.0 CRONDUTER SYSTEMS 13 - 21 14 3/4 - 15/8 - 9.9 O COMPUTER TASK GROUP 1 - 2 1 1/4 0 0.0 COMPUTER TASK GROUP 1 - 2 1 1/4 - 10.0 O COMPUTER TASK GROUP 1 - 2 1 1/4 - 10.0 O COMPUTER TASK GROUP 1 - 2 1 1/4 - 10.0 O COMPUTER TASK GROUP 2 - 6 2 1/4 - 1/4 - 10.0 O COMPUTER TASK GROUP 1 - 2 1 1/4 - 10.0 O COMPUTER SYSOE 2 - 6 2 1/4 - 1/4 - 10.0 O COMPUTER SYSOE 2 - 7 1/4 - 10.0 O COMPUTER SYSOE 2 - 7 1/2 - 10.0 O COMPUTER SYSOE 2 - 7 1/4 - 1/4 - 10.0 O COMPUTER SYSOE 2 - 7 1/2 - 1 3/8 - 1/8 - 1/8 O COMPUTER SYSOE 1 - 2 1 3/8 - 1/8 - 1/8 O COMPUTER SYSOE 1 - 2 1 3/8 - 1/8 - 1/8 O COMPUTER SYSOE 1 - 2 1 3/8 - 1/8 - 1/8 O COMPUTER SYSOE 1 - 2 1 3/8 - 1/8 - 1/8 O COMPUTER SYSOE 2 - 6 2 1/4 - 1/4 - 10.0 O COMPUTER SYSOE 2 - 7 1/2 - 1.0 O COMPUTER SYSOE 2 - 7 1/4 - 1/4 - 10.0 O COMPUTER SYSOE 2 - 7 1/4 - 1/4 - 10.0 O COMPUTER SYSOE 2 - 7 1/4 - 1/4 - 10.0 O COMPUTER SYSOE 2 - 7 1/4 - 1/4 - 10.0 O COMPUTER SYSOE 2 - 7 1/4 - 1/4 - 1/4 - 1/4 O COMPUTER SYSOE 2 - 7 1/8 - 1/4 - 1/8 - 1/8 O COMPUTER SYSOE 2 - 7 1/8 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/2 - 1/8 - 1/8 O COMPUTER SYSOE 2 - 7 1/8 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/8 - 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/8 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O COMPUTER SYSOE 1 - 1 1/4 - 1/4 O CO | ITAL EQUIPMENT | 46- 60 | 53 | 1/4 | + 1/4 | +0.4 | 0 | COMPUTER NETWORK | 2- | 8 | 6 1/4 | - 1/8 | -1.9 |
| CTRONIC ENGINEER. 7- 16 8 7- 174 -3-0. PR-PHASE SYSTEMS 13- 21 14 374 -15-68 -9-9. O COMPUTER USAGE 2- 6 2 174 -174 -10-0. O O-0. O O-0 | CTRONIC ASSOC. | 2- 5 | 2 | 1/4 | 0 | 0.0 | N | COMPUTER SCIENCES | 4- | 8 | 7 | 0 | |
| R-PHASE SYSTEMS 13-21 14 3/4 - \(^1\) 5/8 - 9.9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | CTRONIC ENGINEER. | 7- 16 | 8 | | - 1/4 | -3.0 | 0 | | | | 1 1/4 | 0 | |
| RATE AUTOMATION 4 - 11 8 1/8 + 11/8 + 16.0 | R-PHASE SYSTEMS | 13- 21 | 14 | 3/4 | -1 5/8 | | 0 | | | | | - 1/4 | |
| SANT AUTOMATION 4-11 8 1/8 +1 1/8 +16.0 0 O. | BORO | | | | | | | | | | | | |
| COMPUTER CORP 1- 1 | | | | | | | ~ | | | | | | |
| LETT-PACKARD CO | | | | | | | | | | | | | |
| EYMELL INC 34-56 46 - 1/8 -0.2 7 INFONATIONAL INC 1- 1 1/8 0 0.0 0.0 | | | 0.3 | | | | | | | | | | |
| 227-288 270 I/4 +1 I/2 +0.5 | | | | | | | | | | | | | |
| AGEMENT ASSIST 1- 9 7 1/2 - 1/8 -1.6 DEFX 17-33 23 3/8 - 3/8 -1.5 RODATA CORP 10- 28 17 5/8 + 3/4 +4.4 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 -7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 -7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 -7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR COMPUTER SYS 3- 14 4 7/8 - 3/8 - 7.1 DLAR SYSTEMS INC 17- 23 22 0 0.0 DLAR SYSTEMS INC 17- 23 22 0 0.0 DLAR SYSTEMS INC 17- 23 22 1/2 + 1/8 + 1/8 + 1.5 DLAR SYSTEMS SYSTEMS INC 17- 23 22 1/8 0 0.0 DLAR ASSOCIATES 12- 17 13 7/8 - 1/8 - 7.1 DLAR SYSTEMS SYSTEMS 1- 1 1/4 0 0.0 DLAR ASSOCIATES 12- 17 13 7/8 - 1/8 - 7.1 DLAR COMPUTER CORP 1- 8 7 5/8 1 1/8 + 1/8 + 1/8 DLAR SYSTEMS SYSTEMS 3- 5 3 7/8 0 0.0 DLAR COMPUTER CORP 1- 8 1 1/8 - 1/8 - 7.1 DLAR COMPUTER SYS 3- 14 1/2 - 7.0 DLAR COMPUTER SYS 3- 14 1/2 - 7.0 DLAR COMPUTER SYS 3- 14 1/2 - 7.0 DLAR SYSTEMS SYSTEMS 3- 5 3 7/8 0 0.0 DLAR COMPUTER SYS 3- 14 1/2 - 7.0 DLAR SYSTEMS SYSTEMS 3- 5 3 7/8 0 0.0 DLAR COMPUTER SYS 3- 14 1 1/8 - 1 | CIMERT INC | | | | | | | | | | | 4 | |
| DREX 17-33 23 3/8 - 3/8 - 1.5 RODATA CORP 10-28 17 5/8 + 3/4 + 4.4 ULAR COMPUTER SYS 3-14 4 7/8 - 3/8 -7.1 ULAR COMPUTER SYS 3-14 4 7/8 - 3/8 -7.1 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 19-27 20 + 3/8 + 1/9 - 1/8 - 1/9 - 2.7 WE COMPUTER INC 19-27 20 + 3/8 + 1/9 - 2.4 WE COMPUTER SYS 3-14 4 7/8 - 3/8 - 2/8 - 2/8 WE COMPUTER SYS 3-14 4 7/8 - 1/2 - 2.8 WE COMPUTER SYS 3-14 4 7/8 - 1/2 - 2.8 WE COMPUTER SYS 3-14 4 7/8 - 1/2 - 2.8 WE COMPUTER SYS 3-14 4 7/8 - 1/2 - 2.8 WE COMPUTER SYS 3-14 4 7/8 - 1/2 - 2.8 WE COMPUTER SYS 3-14 4 7/8 - 1/8 - 2.8 WE COMPUTER SYS 3-14 4 7/8 - 1/8 - 2.8 WE COMPUTER SYS 3-14 4 7/8 - 1/8 | ACCHENT ACCES | | | | | | | | | | | | |
| RECOMPUTER SYS 3-14 4 7/8 - 3/8 - 7.1 ULAR COMPUTER SYS 3-14 4 7/8 - 3/8 - 7.1 ULAR COMPUTER SYS 3-14 4 7/8 - 3/8 - 7.1 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 ULAR COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WE COMPUTER INC 4-18 16 3/4 - 1/2 - 2.8 WATTOWAL CSS INC 13-25 23 1/2 + 1/2 + 2.1 WATTOWAL CSS INC 13-25 23 1/2 + 1/2 + 2.1 WATTOWAL CSS INC 17-25 22 + 1/8 + 0.5 WATTOWAL CSS INC 17-25 22 | | | | | | | 0 | IPS COMPUTER MARKET. | 1- | 6 | L | 0 | 0.0 |
| DUAR COMPUTER SYS 3-14 4 7/8 - 3/8 - 7.1 NE COMPUTER INC | | | | | | | | | - | | | | |
| ULAR COMPUTER SYS 3- 14 | RODATA CORP | 10- 28 | 17 | 5/8 | + 3/4 | +4.4 | | | | | | | |
| 24-37 35 1/2 - 5/8 -1.7 A MANGEMENT DATA 1- 3 2 0 0.0 A MATIONAL CSS INC INCELMER 10-27 20 + 3/8 +1.9 O NATIONAL CSS INC INCELMER 10-27 20 + 3/8 +1.9 O NATIONAL CSS INC INCELMER 10-27 20 + 3/8 +1.9 O NATIONAL CSS INC INCELMER 10-27 20 + 3/8 +1.9 O NATIONAL CSS INC INCELMER 10-27 20 + 3/8 +1.9 O NATIONAL CSS INC INCELMER 10-27 20 + 1/8 +1.5 INC INCELMER 10-27 20 + 3/8 -6.2 NATIONAL CSS INC INCELMER 10-27 20 + 1/8 +1.5 INC INCELMER 10-27 20 O NATIONAL CSS INC INCELMER 10-27 20 O NATIONAL CSS INC INCELMENT 10-27 20 O NATIONAL CSS INC INCELMENT | | | | | | | - | | | | | | |
| ME COMPUTER INC 4-18 16 3/4 - 1/2 -2.8 A NATIONAL CSS INC 13-25 23 1/2 + 1/2 +2.1 (IN-ELMER 19-27 20 + 3/8 +1.9 O NATIONAL DAT CORP 4-7 5 1/8 + 1/4 +5.1 INC 17-23 22 + 1/8 +0.5 O NATIONAL DAT CORP 4-7 5 1/8 + 1/4 +5.1 O NATIONAL DAT CORP 4-7 5 1/8 + 1/4 +5.1 O NATIONAL DAT CORP 4-7 5 1/8 + 1/4 +5.1 O NATIONAL DAT CORP 4-7 5 1/8 + 1/4 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL DAT CORP 4-7 5 1/4 + 1/5 +5.5 O NATIONAL D | ULAR COMPUTER SYS | | | | | -7.1 | 0 | LOGICON | 3- | 8 | | + 1/8 | +1.6 |
| KIN-ELMER 19-27 20 + 3/8 +1.9 | | 24- 37 | 35 | 1/2 | - 5/8 | -1.7 | A | MANAGEMENT DATA | 1- | 3 | 2 | 0 | 0.0 |
| THEON CD 45- 67 59 5/8 -1 1/2 -2.4 A ON LINE SYSTEMS INC 17- 23 22 + 1/8 +0.5 NATION 40- 52 43 1/8 -2 7/8 -6.2 ON PLANNING RESEARCH 3-5 3 5/8 0 0.0 OR INC 9-31 12 1/4 -3/4 -5.7 ON PLANNING RESEARCH 3-5 3 5/8 0 0.0 OR INC 9-31 12 1/4 -3/4 -5.7 ON PROGRAMMING & SYS 1-1 1 1/4 0 0.0 OR PROGRAMMING & SYS 1-1 1 1/4 0.0 OR PROGRAM IN THE PR | ME COMPUTER INC | 4- 18 | 16 | 3/4 | - 1/2 | -2.8 | A | NATIONAL CSS INC | 13- 2 | 5 | 23 1/2 | + 1/2 | +2.1 |
| RRY PAND 40-52 43 1/8 -2 7/8 -6.2 N PLANTING RESEARCH 3-5 5 3 5/8 0 0.0 0.0 RING RESEARCH 3-1 1 1/4 0 0.0 0.0 REMS ENG. LARS 5-10 6 0 0.0 REMS ENG. LARS 5-10 1-2 14 -3/4 -1/8 -2.6 COMPUTER CORP 1-8 7 5/8 +1/8 +1.6 LEASING COMPANIES | KIN-ELMER . | 19- 27 | 20 | | + 3/8 | +1.9 | 0 | NATIONAL DAT CORP | 4- | 7 | 5 1/8 | + 1/4 | +5.1 |
| DRING 9-31 12 1/4 - 3/4 - 5-7 0 PROGRAMMING & SYS | THEON CO | 45- 67 | 59 | 5/8 | -1 1/2 | -2.4 | A | ON LINE SYSTEMS INC | 17- 2 | 3 | 22 | + 1/8 | +0.5 |
| RR INC 9-31 12 1/4 - 3/4 - 5-7 0 PAPIDATA INC 2-5 2 1/8 0 0-0 (AN ASSOCIATES 12-17 13 7/8 - 1/8 - 0-8 (CABS.) 11-20 14 - 3/8 - 2-6 (CABS.) 11-20 14 - 3/8 - 3/8 - 2-6 (CABS.) 11-20 14 - 3/8 - 3/8 - 2-6 (CABS.) 11-20 14 - 3/8 - 3/8 - 3-6 (CABS.) 11-20 14 - 3/8 - 3/8 - 3-6 (CABS.) 11-20 14 - 3/8 - 3/8 - 3-6 (CABS.) 11-20 14 - 3/8 - 3/8 - 3/8 (CABS.) 12-20 14 - 3/8 - 3/8 - 3/8 (CABS.) 12-20 14 - 3/8 - 3/8 - 3/8 (CABS.) 12-20 14 - 3/8 (CABS.) 12-20 14-20 14-20 14-20 14-20 14-20 14-20 14-20 14-20 14-20 14-20 14-20 | RRY RAND | 40- 52 | 43 | 1/8 | -2 7/8 | -6.2 | N | PLANNING RESEARCH | 3- | 5 | 3 5/8 | 0 | 0.0 |
| TEMS SYG. LARS 5-10 6 0 0.0 0.0 0 PAPIDATA INC 2-5 2 1/8 0 0.0 0.0 CAN ASSOCIATES 12-17 13 7/8 -1/8 -0.8 0 REYNOLDS REYNOLD 13-21 18 3/4 +1 +5.6 CAN ASSOCIATES 11-20 14 -3/8 -2.6 0 SCIENTIFIC COMPUTERS 1-1 7/8 0 0.0 0 TYMSHARE INC 14-28 18 3/4 +1 +5.6 CAN ASSOCIATE COMPUTER CORP 1-8 7 5/8 +1/8 +1.6 0 0.0 0 TYMSHARE INC 15-20 16 15-20 17 15/8 0 0.0 0 TYMSHARE INC 15-20 15-20 17 15/8 0 0.0 0 TYMSHARE INC 15-20 15 | OR INC | 9- 31 | 12 | 1/4 | - 3/4 | -5.7 | 0 | | 1- | 1 | 1/4 | 0 | 0.0 |
| AN ASSOCIATES 12- 17 13 7/8 - 1/8 -0.8 0 REYNOLDS & REYNOLD 13- 21 18 3/4 +1 +5.6 CLARS. 11- 20 14 - 3/8 -2.6 0 SCIENTIFIC COMPUTERS 1- 1 7/8 0 0.0 TYMSHARE INC 14- 28 18 3/4 +1 +5.6 OTHER COMPUTER CORP 1- 8 7 5/8 + 1/8 +1.6 OTHER CORP 1- 8 7 5/8 - 1/8 -7.1 TYMSHARE INC 14- 28 18 3/4 +1 +1 +5.6 OTHER COMPUTER CORP 1- 7 1 5/8 0 0.0 OTHER COMPUTER CORP 1- 3 1 1/8 - 1/8 - 7.1 TYMSHARE INC 14- 28 18 3/4 +1 +1 +5.6 OTHER COMPUTER CORP 1- 7 1 5/8 0 0.0 OTHER COMPUTER CORP 1- 7 1 5/8 0 0.0 OTHER COMPUTER CORP 1- 8 7 5/8 - 1/8 -7.1 TYMSHARE INC 14- 28 18 3/4 +1 +1 +5.6 OTHER COMPUTER COMPUTER CORP 1- 7 1 5/8 0 0.0 OTHER COMPUTER CORP 1- 7 1 5/8 0 0.0 OTHER COMPUTER CORP 1- 3 1 1/8 +1/8 +12.5 OTHER CORP 1- 3 1 1/8 - 1/8 +12.5 OTHER COMPUTER CORP 1- 1 1/2 + 3/8 +300.0 OTHER CORP 1- 1 1/2 + 3/8 +300.0 OTHER CORP 1- 1 1/8 0 0.0 OTHER CORP 1- 1 1 1/8 0.0 OT | TEMS ENG. LASS | 5- 10 | | | 0 | 0.0 | | | | 5 | | 0 | |
| SLEASING COMPANIES LEASING COMP | | 12- 17 | 13 | 7/8 | - 1/8 | | | | | | | +1 | |
| LEASING COMPANIES THE COMPUTER CORP 1- 8 7 5/8 + 1/8 +1.6 DISCO INC 3- 10 9 - 1/4 -2.7 SERCE GROUP CORP 2- 3 1 5/8 - 1/8 -7.1 UTER INVSIRS GRP 1- 3 1 1/2 - 3/8 -20.0 RONIC RENTAL 1- 8 1 1/8 + 1/8 +12.5 INC 1- 1 3/4 - 1/8 -18.6 INC 5- 8 6 5/8 - 1/2 -7.0 COCORP 6- 20 18 - 3/8 -2.0 COCORP 6- 20 18 - 3/8 -2.0 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 6- 9 7 3/8 - 1/8 -1.6 DIAC CORP 7- 12 10 1/4 + 1/8 +1.2 DIAC CORPUTER CONSULES 4- 7 5 DIAC COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 DIAC COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 DIAC CONSULTED 4- 1/8 -1.2 | | | | | | | - | | | | | | |
| LEASING COMPANIES A URS SYSTEMS 3-5 3 778 0 0.0 0 N WYLY CORP 1-7 1 578 0 0.0 0 N WYLY CORP 1-7 1 578 0 0.0 0 N WYLY CORP 1-7 1 578 0 0.0 0 PERIPHERALS & SUBSYSTEMS: PERIPHERALS & SUBSYSTEMS: PERIPHERALS & SUBSYSTEMS: PERIPHERALS & SUBSYSTEMS: N ADDRESSOGRAPH—MULT 8-13 1 2 578 4 378 43.0 ADDRESSOGRAPH—MULT 8-13 1 5 78 0 0.0 ADDRESSOGRAPH—MULT 8-13 1 5 78 0 0.0 ADDRESSOGRAPH—MULT 8-13 1 5 78 0 0.0 APPLIED DIG DATA SYS 13-25 16 0 0.0 APPLIED DIG DATA | S CHASS | | 7.4 | | 3,0 | 200 | | | | | | | |
| THE COMPUTER CORP 1- 8 7 5/8 + 1/8 +1.6 1.6 1.5 1.0 1.0 9 - 1/4 -2.7 1 9.6 1.0 9 - 1/4 -2.7 1 9.6 1.0 9 - 1/4 -2.7 1 9.6 1.0 9 - 1/4 -2.7 1 9.6 1.0 9 - 1/4 -2.7 1 9.6 1.0 9 - 1/4 -2.7 1 9.6 1.0 9.6 | LEAS | ING COMPA | MIES | | | | | | | | | | |
| THE COMPUTER CORP 1-8 7 5/8 + 1/8 +1-6 7 15 0 9 - 1/4 -2-7 PERIPHERALS & SUBSYSTEMS** VICER INVSIRS GRP 2-3 1 5/8 - 1/8 -7-1 N ADDRESSOGRAPH-MULT 8-13 1 2 5/8 + 3/8 +3-0 NONIC RENTAL 1-8 1 1/8 + 1/8 +12-5 NONIC RENTAL 1-8 1 1/8 -18-6 N AMPEX CORP 5-10 7 3/4 + 1/2 +6-8 NONIC RENTAL 1-8 1 5/8 - 1/2 -7-0 NONIC RENTAL 1-8 1 5/8 - 1/2 -7-0 NONIC RENTAL 1-8 1 5/8 - 1/2 -7-0 NONIC RENTAL 1-8 1 1/8 + 1/8 +12-5 NONIC RENTAL 1-8 1 1/8 -18-6 N AMPEX CORP 5-10 7 3/4 + 1/2 +6-8 NONIC RENTAL 1-8 1 1/8 -18-6 N AMPEX CORP 5-10 7 3/4 + 1/2 +6-8 NONIC RENTAL 1-8 1 1/8 -2-0 NONIC RENTAL 1-8 1 1/8 1 1/8 -2-0 NONIC RENTAL 1-8 1 1/ | 6643 | THO COMPA | WATE 2 | | | | | | | | | | |
| DISCO INC 3- 10 9 - 1/4 -2-7 PERIPHERALS 6 SUBSYSTEMS* PERCE GROUP CORP 2- 3 1 1/2 - 3/8 -20-0 N ADDRESSORAPH-MULT 8- 13 12 5/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 13 12 5/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 + 3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 +3/8 +3/8 +3-0 N ADDRESSORAPH-MULT 8- 10 18 1/8 +3/8 +3/8 +3/0 N ADDRESSORAPH-MULT 8- 10 18 1/8 +3/8 +3/8 +3/0 N ADDRESSORAPH-MULT 8- 10 18 1/8 +3/8 +3/8 +3/0 N ADDRESSORAPH-MULT 8- 10 18 1/8 +3/8 +3/8 +3/0 N ADDRESSORAPH-MULT 8- 10 18 1/8 +3/8 +3/8 +3/0 N ADDRESSORAPH-MULT 8- 10 18 1/8 +3/8 +3/8 +3/0 N ADDRESSORAPH-MULT 8- 10 18 1/8 +3/8 +3/8 +3/8 +3/8 +3/8 +3/8 +3/8 +3 | THE COMPUTED CORD | 1 0 | 7 | 5/0 | . 1/0 | 41.6 | 14 - | MALLA CURE | 1- | | 1 5/9 | U | 0.0 |
| *** SERGE GROUP CORP | | | | 2/6 | | | | 2521215 | | cure | ACTEMO: | | |
| PUTER INVSIRS GRP 1- 3 1 1/2 - 3/8 -20.0 N ADDRESSORAPH-MULT 8- 13 12 5/8 + 3/8 +3.0 N ADDRESSORAPH-MULT 8- 13 12 5/8 + 3/8 +3.0 N ADDRESSORAPH-MULT 8- 13 12 5/8 + 3/8 +3.0 N ADDRESSORAPH-MULT 8- 13 12 5/8 + 3/8 +3.0 N ADDRESSORAPH-MULT 8- 15 12 - 1 - 7.0 N ADDRESSORAPH-MULT 8- 15 12 - 10 8 1/8 + 3/8 + 4.8 N AMPEX CORP 5- 10 7 3/4 + 1/2 +6.8 N AMPEX CORP 5- 10 7 3/4 +1/2 +6.8 N AMPEX CORP 5- 10 7 3/4 +1/2 +6.8 N AMPEX CORP 5- 10 7 3/4 +1/2 +6.8 N AMPEX CORP 5- 10 7 3/4 +1/2 +6.8 N AMPEX CORP 5- 10 7 3/4 +1/2 +6.8 N AMPEX CORP 5- 10 7 3/4 +1/2 +6.8 N AMPEX CORP 5- 10 7 3/4 +1/2 +6.8 N AMPEX CORP 5- 1 | | | | = 10 | | | | PERIPHE | KALS & | 50BS | APIEMS | | |
| NONIC RENTAL I - 8 | | | | | | | | | | _ | | | |
| INC 1-1 3/4 - 1/8 -18.6 N AMPEX CORP 5-10 7 3/4 + 1/2 +6.8 N AMPEX CORP 5- 8 6 5/8 - 1/2 -7.0 O ANDERSON JACOBSON 2-4 3 0 0 0.0 CORP 6- 15 12 -1 -7.6 D APPLIED DIG DATA SYS 13-25 16 0 0.0 CORP 6- 20 16 - 3/8 -2.0 D APPLIED DIG DATA SYS 13-25 16 0 0.0 CORP 6- 20 16 - 3/8 -3.0 D APPLIED DIG DATA SYS 13-25 16 0 0.0 CORP 6- 9 7 3/8 -1/8 -1.6 D APPLIED DIG DATA SYS 13-25 16 0 0.0 CORP 6- 9 7 3/8 -1/8 -1.6 D APPLIED DIG DATA SYS 13-25 16 0 0.0 CORP 6- 9 7 3/8 -1/8 -1.6 D APPLIED DIG DATA SYS 13-25 16 0 0.0 CORP 6- 9 7 3/8 -1/8 -1.6 D APPLIED DIG DATA SYS 13-25 16 0 0.0 CORP 6- 9 7 3/8 -1/8 -1.6 D APPLIED DIG DATA CORP 7-10 T 1/8 0 0 0.0 CORP 7-10 T 1/8 0 0 0 0.0 CORP 7-10 T 1/8 0 0 0 0.0 CORP 7-10 T 1/8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | | | | | | | | | | | | |
| INC 5-8 6 5/8 -1/2 -7-0 0 ANDERSON JACOBSON 2-4 3 0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0 0 0. | | | 1 | | | | | | | | | | |
| 6- 15 12 -1 -7.6 0 APPLIED DIG DATA SYS 13- 25 16 0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 | | | | | | | | | | | | | |
| CO CARP 6-20 18 - 3/8 -2.0 7 BEENIVE MEDICAL ELEC 3-11 10 - 7/8 -8.0 PAC CORP 0-1 1/2 + 3/8 +30.0 0 A BOLT, BERANEK 6. NEW 7-11 7 1/8 0 0.0 PAC CORP 1 1/8 0 0.0 PAC CORP 1 1/8 -1.6 PAC COMPUTER COMSULES 1 1 1 3/4 -1/8 -1.6 PAC COMPUTER CONSULES 1 1 3/4 -1/8 -6.6 PAC | INC | | | 5/8 | | | | | | | | | |
| PAC CORP O- 1 | | | | | | | | | | | | | |
| TNC | | | 18 | | | | 0 | BEEHIVE MEDICAL ELEC | 3- 1 | 1 | | | -8.0 |
| LEASING | SPAC CORP | | | | | | A | BOLT BERANEK & NEW | | | | | |
| LEASING 7- 12 10 1/4 + 1/8 +1-2 0 CAMBRIDGE MEMURIES 0- 6 3/4 + 7/8 +3-3 N CENTRONICS DATA COMP 20- 36 26 7/8 + 7/8 +3-3 O CODEX CORP 22- 42 31 0 0.00 CONTRONICS 1- 1 3/4 - 1/8 -14-2 O COMPUTER COMMUN. 1- 6 43/8 - 1/8 -2-7 O COMPUTER COMMUN. 1- 6 43/8 - 1/8 -2-7 O COMPUTER COMMUN. 1- 3 1 3/4 - 1/8 -6-6 O COMPUTER EQUIPMENT 1- 3 1 3/4 - 1/8 -6-6 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 O COMPUTER COMMUN. 4- 10 9 5/8 - 1/8 -1-2 | INC | 0- 1 | | 1/8 | 0 | 0.0 | N | BUNKER-RAMO | 5- 1 | 0 | 8 3/4 | 0 | 0.0 |
| N CENTRONICS DATA COMP 20- 36 26 7/8 + 7/8 + 3.3 O CODEX CORP 22- 42 31 0 0 0.0 O COGNITRONICS 1- 1 3/4 - 1/8 -14.2 O COMPUTER COMMUN. 1- 6 4 3/8 - 1/8 -2.7 O COMPUTER CONSULES 4- 7 5 - 1/2 -9.0 A COMPUTER COUNTY 1- 3 1 3/4 - 1/8 -6.6 O COMPUTER EQUIPMENT 1- 3 1 3/4 - 1/8 -6.6 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 N=NEW YORK; A=AMERICAN; P=PHIL-BALT-MASH | EER TEX CORP | 6- 9 | 7 | 3/8 | - 1/8 | -1.6 | A | CALCOMP | 4- | 7. | 4 1/8 | - 1/8 | -2.9 |
| N CENTRONICS DATA COMP 20- 36 26 7/8 + 7/8 + 3.3 O CODEX CORP 22- 42 31 0 0 0.0 O COGNITRONICS 1- 1 3/4 - 1/8 -14.2 O COMPUTER COMMUN. 1- 6 4 3/8 - 1/8 -2.7 O COMPUTER CONSULES 4- 7 5 - 1/2 -9.0 A COMPUTER COUNTY 1- 3 1 3/4 - 1/8 -6.6 O COMPUTER EQUIPMENT 1- 3 1 3/4 - 1/8 -6.6 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 N=NEW YORK; A=AMERICAN; P=PHIL-BALT-MASH | LEASING | 7- 12 | 10 | 1/4 | + 1/8 | +1.2 | 0 | | 0- | 5 | 3/4 | | |
| O CODEX CORP 22- 42 31 0 0.0 O COGNITRONICS 1- 1 3/4 - 1/8 -14-2 O COMPUTER COMMUN. 1- 6 4 3/8 - 1/8 -2-7 O COMPUTER COMMUN. 1- 6 4 3/8 - 1/8 -2-7 O COMPUTER COMPUTER COMMUN. 1- 3 1 3/4 - 1/8 -6-6 O COMPUTER EQUIPMENT 1- 3 1 3/4 - 1/8 -6-6 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 O COMTEN 4- 10 9 5/8 - 1/8 -1-2 | | | | | | | | | 20- 3 | 5 2 | 6 7/8 | + 7/8 | |
| O COGNITRONICS 1- 1 3/4 - 1/8 -14-2 O COMPUTER COMMUN. 1- 6 4 3/8 - 1/8 -2-7 O COMPUTER CONSULES - 4- 7 5 - 1/2 -9-0 A COMPUTER COULES - 4- 7 5 - 1/2 -9-0 A COMPUTER EQUIPMENT 1- 3 1 3/4 - 1/8 -6-6 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0-0 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0-0 O COMPUTER TRANSCEIVER 4- 10 9 5/8 - 1/8 -1-2 | | | | | | | | | | | | | |
| O COMPUTER COMMUN. 1- 6 4 3/8 - 1/8 -2.7 O COMPUTER CONSULES . 4- 7 5 - 1/2 -9.0 A COMPUTER EQUIPMENT 1- 3 1 3/4 - 1/8 -6.6 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 | | | | | | | | | | | | | |
| O COMPUTER CONSULES 4- 7 5 - 1/2 -9.0 A COMPUTER EQUIPMENT 1- 3 1 3/4 - 1/8 -6.6 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 O CONTEN 4- 10 9 5/8 - 1/8 -1.2 | | | | | | | | | | | | | |
| A COMPUTER EQUIPMENT 1- 3 1 3/4 - 1/8 -6.6 O COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 N=NEW YORK: A=AMERICAN: P=PHIL-BALT-MASH O CONTEN 4- 10 9 5/8 - 1/8 -1.2 | | | | | | | | | | | | | |
| 0 COMPUTER TRANSCEIVER 1- 3 5/8 0 0.0 N=NEW YORK: A=AMERICAN: P=PHIL-BALT-WASH 0 COMTEN 4- 10 9 5/8 - 1/8 -1.2 | | | | | | | 0 | | | | | | |
| N=NEW YORK: A=AMERICAN: P=PHIL-BALT-WASH O COMTEN 4- 10 9 5/8 - 1/8 -1.2 | | | | | | | A | | | | | | |
| | | | | | | | | | | | | | |
| | N=NEW YORK; A=AM | ERICAN: P | =9411 | -BAL | T-WASH | | D N | CONTEN CONRAC CORP | | | | - 1/8 | -1.2 |

| 9 | U | mmary | | TRADE#QUOTES, INC. Cambridge, Mass. 02139 | | | | | | |
|--------|-------------|--|----------------------|---|-------------------------|----------------------|--|--|--|--|
| K T | EXCH | | 1976 RANGE (1) | CLOSE DEC 22 | CE WEEK NET CHNGE | WEEK | | | | |
| | | | | | | | | | | |
| 5 | 0 | DATA ACCESS SYSTEMS | 1- 5 | 4 1/4 | | 0.0 | | | | |
| 7 | 0 | DATA ACCESS SYSTEMS DATA 100 | 6- 13 | 7 3/8 | - 3/8 | 0.0 | | | | |
| 0 | A | DATA PRODUCTS CORP DATA TECHNOLOGY | 5- 15 | 11 5/8 | - 5/8 | -5.1 | | | | |
| 2 2 | 0 | DATUM INC | 1- 3 | 3 3/8 | +1 | +42.1 | | | | |
| 0 | 0 | DECISION DATA COMPUT | 1- 4 | 2 | 0 | 0.0 | | | | |
| 0 | 7 | DELTA DATA SYSTEMS | 1- 1 | 3/8 | - 1/8 | -25.0 | | | | |
| 0 | N | FARRI-TEK | 1- 4 | 3 5/8 | + 3/8 | +11.5 | | | | |
| 9 | 0 | GENERAL COMPUTER SYS | 0- 2 | 1/2 | + 1/8 | -7.7 +33.3 | | | | |
| 0 | N | HAZELTINE CORP | 4- 12 | 9 1/8 | - 1/4 | -2.6 | | | | |
| 2 | N | HARRIS CORP | 34- 57 | 56 3/8 | - 7/8 | -1.5 | | | | |
| 3 | Ô | INCOTERM CORP | 9- 20 | 12 3/8 | - 3/8 | -2.9 | | | | |
| | 0 | INFORMATION INTL INC | 10- 18 | 13 | +1 1/8 | +6.9 | | | | |
| | 0 | INTEL CORP | 47-109 | 56 | +1 1/2 | +2.7 | | | | |
| | A | LUNDY ELECTRONICS | 3- 7 | 3 5/8 | - 1/4 | -6.4 | | | | |
| | M | DATA PRODUCTS CORP DATA TECHNILOGY DATUM INC DECISION DATA COMPUT DELTA DATA SYSTEMS ELECTRONIC M & M FABRI-TEK GENERAL COMPUTER SYS HAZELTINE CORP HARRIS CORP INCOTERM CORP INFOREX INC INFORMATION INTL INC INTEL CORP LUNDY ELECTRONICS MSI DATA CORP MILED ELECTRONICS | 15- 22 | 20 3/4 | + 3/8 | +5.8 | | | | |
| - 1 | N | MOHAWK DATA SCI | 3- 10 | 6 1/8 | 0 | 0.0 | | | | |
| | 0 | PENRIL CORP | 1- 3 | 2 | 0 | 0.0 | | | | |
| | A | POTTER INSTRUMENT | 3- 8 | 1 2/4 | + 1/8 | | | | | |
| | 0 | PRECISION INST. | 2- 10 | 1 1/2 | 0 | 0.0 | | | | |
| | 0 | QUANTOR CORP | 4- 6 | 5 1/8 | 0 | 0.0 | | | | |
| | 0 | RECOGNITION EQUIP | 6- 11 | 9 7/8 | 0 | 0.0 | | | | |
| | 0 | SCAN DATA | 1- 4 | 1 3/8 | - 3/4 | -7.3 +4.7 | | | | |
| | 0 | STORAGE TECHNOLOGY | 9- 13 | 10 5/8 | - 1/2 | -4.4 | | | | |
| | 0 | T BAR INC | 5- 10 | 6 7/8 | ~ 1/8 | -1.7 | | | | |
| - 1 | 0 | TALLY CORP. | 4- 6 | 5 7/8 | 0 | 0.0 | | | | |
| | N | TEKTRONIX INC | 45- 69 | 63 3/4 | 0 -1 1/2 - 1/8 | -2-2 | | | | |
| | N | TELEX | 2- 5 | 2 1/2 | - 1/8 | -4.7 | | | | |
| 1 | 0 | MOHAMK DATA SCI PENRIL CORP PERTEC CORP PETTEC TORP POTTER INSTRUMENT PRECISION INST. QUANTOR CORP RECOGNITION EQUIP SANDERS ASSOCIATES SCAN DATA STORAGE TECHNOLOGY T BAR INC TALLY CORP. TEC INC TEC INC TEC TEC TELEX WANGED INC WILLER INC | 2- 2 | 3/4 | + 1/4 | 0.0 | | | | |
| | | | | | | | | | | |
| - 1 | n | ADVANCED SYSTEMS INC | 1- 4 | 3 1/4 | 0 | 0.0 | | | | |
| | 0 | BALTIMORE BUS FORMS | 3- 5 | 3 1/4 | 0 | 0.0 | | | | |
| - 1 | A | CASEDWATICS INC | 6- 11 | 11 | +1 3/8 | +14.2 | | | | |
| - 1 | A | DATA DOCUMENTS | 25- 45 | 45 | 0 | 0.0 | | | | |
| | 0 | DUPLEX PRODUCTS INC | 13- 24 | 13 1/2 | - 1/4 | -1.8 | | | | |
| | N O | ENNIS BUS. FORMS . | 6- 8 | 5 7/8 | 0 | 0.0 | | | | |
| | 0 | GRAPHIC CONTROLS | 13- 19 | 16 3/6 | - 1/4 | -1.6 | | | | |
| | N | 3M COMPANY | 53- 66 | 14 3/4 56 1/8 | + 3/8 | +0.6 | | | | |
| | 0 | MOORE CORP LTD | 32- 51 | 35 1/4 | +1 1/2 | +4.4 | | | | |
| 1 | N | STANDARD REGISTER | 11- 20 | 18 1/2 . | - 3/4 . | -3.8 | | | | |
| - 1 | 0 | TAB PRODUCTS CO | 5- 12 | 11 1/2 | + 1/4 | +1.3 | | | | |
| | | 114860 | 40 00 | | 4/6 | | | | | |
| 1 | N | UARCU | 19- 25 | 21 1/2 | + 3/8 | +1.7 | | | | |
| | N A N | ADVANCED SYSTEMS INC BALTIMORE BUS FORMS BARRY WRIGHT CYBERMATICS INC DATA DOCUMENTS DUPLEX PRODUCTS INC ENNIS BUS. FORMS GRAHAM MAGNETICS GRAPHIC CONTROLS BUS. FORMS MOORE CORP LTD NASHUA CORP STANDARD REGISTER TAB PRODUCTS CO UARCO WARDASH MAGNETICS WALLACE BUS FORMS | 4- 11 | 10 1/4 | + 3/8 - 5/8 - 5/8 | +1.7 -5.7 -2.9 | | | | |

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